TOWN COUNCIL – AGENDA REQUEST FORM

THIS FORM WILL BECOME PART OF THE BACKGROUND INFORMATION USED BY THE COUNCIL AND PUBLIC

Please submit Agenda Request Form, **including back up information**, 8 days prior to the requested meeting date. **Public Hearing requests must be submitted 20 days prior to the requested meeting date to meet publication deadlines** (exceptions may be authorized by the Town Manager, Chairman/Vice Chair).

MEETING INFORMATION

Date Submitted: 4/23/15 | Date of Meeting: 5/14/15

Submitted by: Michael Currier | Time Required: 15 min

Department: Fire/Emergency Mgt. | Background Info. Supplied: Yes ☒ No ☐

Speakers: Chief Currier

CATEGORY OF BUSINESS (PLEASE PLACE AN "X" IN THE APPROPRIATE BOX)

Appointment:	☐	Recognition/Resignation/Retirement:	☐
Public Hearing:	☐	Old Business:	☐
New Business:	☐	Consent Agenda:	☒
Nonpublic:	☐	Other:	☐

TITLE OF ITEM

Final Adoption of the Multi Hazard Mitigation Plan

DESCRIPTION OF ITEM

See attached Memorandum

REFERENCE (IF KNOWN)

RSA: | Warrant Article:

Charter Article: | Town Meeting:

Other: | N/A:

EQUIPMENT REQUIRED (PLEASE PLACE AN "X" IN THE APPROPRIATE BOX)

Projector:	☐	Grant Requirements:	☐
Easel:	☐	Joint Meeting:	☐
Special Seating:	☐	Other:	☐
Laptop:	☐	None:	☒

CONTACT INFORMATION

Name:	**Fire Chief M Currier**	Address:	**432 D.W Highway**
Phone Number:	**424-3690**	Email Address:	**mcurrier@merrimacknh.gov**

APPROVAL

Town Manager: Yes ☐ No ☐ | Chair/Vice Chair: Yes ☐ No ☐

Hold for Meeting Date:

MERRIMACK FIRE AND RESCUE DEPARTMENT

Central Fire Station
Headquarters
432 Daniel Webster Highway
Merrimack New Hampshire 03054
603.424.3690 ♣ Fax 603.424.0603

Fire Chief
Michael P. Currier

Assistant Fire Chief
Richard W. Pierson

Assistant Fire Chief
Brian L. Borneman

MEMORANDUM

DATE: April 21, 2015

TO: Eileen Cabanel, Town Manager

FROM: Michael Currier, Chief of the Department

SUBJECT: Final Approval Hazard Mitigation Plan

The Hazard Mitigation Plan is in its final acceptance process. The original plan was updated and the plan was reviewed with the Town Council on 11/16/14 by Jill Longval from the Nashua Regional Planning Commission (NRPC) and the members of the Merrimack Hazard Mitigation Team.

The plan was submitted to FEMA on December 1 2014 so they could conduct a review and determine whether the plan met the established criteria. FEMA Region I has completed its review of the Merrimack, NH, Multi-Hazard Mitigation Plan and found it approvable pending adoption by the town. The Town Council will need to revisit this and adopt the plan. With this approval, the jurisdiction meets the local mitigation planning requirements under 44 CFR 201 pending FEMA's receipt of electronic copies of the adoption documentation and the final plan. Once the plan has been adopted the Town of Merrimack is eligible for grant monies as outlined by FEMA.

It is very important to remember that at this stage in the process the Multi Hazard Mitigation Plan cannot be changed in any way, just final adoption is needed.

Attached is a copy of the Multi Hazard Mitigation Plan and the Adoption Documentation that must be completed. All we have to do is complete the adoption paperwork and forward to Jill at the NRPC and she will attach the document to the original approved Multi Hazard Mitigation Plan and forward that to FEMA.

Any questions please let me know

MOTION CARRIED 6-0-0

The Council returned to the regular order of business.

Appointments

1. Fluvial Erosion Update

Submitted by NRPC Senior Environmental Planner Jill Longval
Share results of Fluvial Erosion study and provide the Town Council with an update on hazard mitigation plan

Ms. Jill Longval, Senior Environmental Planner, Nashua Regional Planning Commission (NRPC), spoke of the draft Hazard Mitigation Plan included with the agenda. The Town's last plan was updated in 2010. FEMA requires municipalities update plans every 5 years in order to maintain eligibility for Federal mitigation grants.

Ms. Longval spoke of having worked, over the past year, with a Hazard Mitigation Team, to update the plan. The team consists of representatives from Fire, Police, Public works, and Community Development departments as well as the Merrimack Village District.

The primary differences between the current plan and the update; no longer include manmade hazards (FEMA desires the plan exclusively address natural hazards), no longer including preparedness actions, e.g., generators (another directive from FEMA), and a grant that came down through the New Hampshire Department of Environmental Services (NHDES) to include a fluvial erosion hazard study. That is simply erosion that is caused by the wearing away from rivers.

Ms. Sara Siskavich, GIS Manager, NRPC, noted the NRPC came before the Council in August of 2013 to announce the start of the fluvial erosion hazard project, and the hazard mitigation plan update. Fluvial erosion is essentially the wearing away of the riverbank by flowing water. It is a natural process and most powerful during flood events. The project is funded by NHDES through a FEMA pre-disaster mitigation grant. The data was delivered in September 2014 after a very wet field season in 2013. Some field work was suspended during that summer because of unsafe working conditions, e.g., high water.

In our region, the study analyzed river reaches in the Souhegan and Piscataquag Watersheds. There was a field component as well as background research utilizing topographic materials, aerial photos, and historic archives. One of the main deliverables of the study is depicted on the map provided; shaded zones which characterize lands most vulnerable to erosion. The zones are relative measures that range from very extreme, which characterizes areas that are already experiencing considerable erosion and the likelihood of further erosion in those areas to the opposite end of the spectrum where there is very low sensitivity; rivers or streams are not likely to change at all.

Another portion of the project was the assessment of culverts. In Merrimack three (3) were assessed. Culverts associated with bridges or through wetlands were not part of the assessment. Culverts were rated on a scale of fully compatible, which meant there was a low risk of failure and replacement was not expected over the lifetime of the culvert to the opposite extreme, which would be fully incompatible; high risk of failure, undersized or poorly aligned with the stream and, when replaced, a

larger or redesigned structure is recommended. The access road over Baboosic Brook was rated mostly compatible. Bean Road over Baboosic Brook culvert was partially compatible, and the Bedford Road over Baboosic Brook culvert was mostly incompatible.

Ms. Longval requested Councilors review the plan and provide input prior to December 1, 2014. The plan has been provided to the Hazard Mitigation Team, which is currently reviewing it. FEMA requires inclusion of mitigation actions along with the associated estimated cost and an implementation table. FEMA does not require the Town to actually implement the mitigation actions as a condition for approval.

Ms. Longval stated input received would be incorporated into the plan and submitted to FEMA on December 1, 2014. FEMA will conduct a review and determine whether the plan has met all criteria. When they decide it has they will send what is called an approval pending adoption. At that point, it will come back to the Council, which can adopt it at a regular meeting. The signed adopted letter would be sent back to FEMA who would then issue a formal approval. At that point, the plan is current for the next 5 years.

Councilor Dwyer spoke of the amount of work that went into the 98 page report. Ms. Longval noted a draft version of the plan is located on NRPC's website.

Councilor Boyd noted language on page 58, which states "Since 1940, there have been 14 earthquakes centered in NH with a magnitude of 3.0 or greater and only two earthquakes with a magnitude of 5.0 or greater. There have been no recorded earthquakes to-date centered in Merrimack, however, one could occur." He questioned whether the statement indicated there are specific faults within Merrimack that are consistent where there could be a seismic shift where an earthquake could be centered in Merrimack. Ms. Longval responded "No; there aren't any identified faults, but it is not out of the question. FEMA likes you to cover your bases. Any time that there is even the possibility that mitigation action could occur you have to include language such as that."

Councilor Mahon stated his belief the Wildcat Falls area was considered to be a fault zone. Ms. Longval responded she has not seen anything about that in her research, and hadn't included it in previous plans. She stated it to be something she could look into. Chairman Harrington noted the library now has a seismic graph reader.

Councilor Boyd offered the following edits: 1) Page 4, David Deane is the President of the Board of Aldermen in Nashua and 2) Page 5; should read Thomas More College not Thomas Moore College.

Councilor Boyd spoke of work having been done on the culvert on Bedford Road after the 500-year flood event and questioned whether addressing the culvert failure was temporary in nature. Acting Town Manager Micali remarked when dealing with FEMA they will only allow for replacement of what is in the ground (nothing larger). What was in the ground was replaced. The Public Works Department went through and did the Wire Road Bridge, and, as the water flows to the Merrimack River, Bedford Road, McGaw Bridge, and Route 3. The three culverts are all on the State's Bridge Aid Plan over the next 3-5 years. All of those culverts will be upsized so that they are compliant.

Town of Merrimack, New Hampshire

Hazard Mitigation Plan Update 2015

Date Approved Pending Adoption: February 26, 2015

Date Adopted:

Date Final Approval:

Prepared with Assistance from the Nashua Regional Planning Commission

NRPC

Funded in part by the NH Department of Safety, Homeland Security and Emergency Management

Table of Contents

CHAPTER I. PLANNING PROCESS

Section 1.1 ~ Overview of Planning Process

The Merrimack Hazard Mitigation Plan Update 2015 was prepared by the Nashua Regional Planning Commission (NRPC) for the Town of Merrimack, NH. NRPC staff worked closely with the Merrimack Hazard Mitigation Team to write this plan. The Merrimack Hazard Mitigation Team included:

- Brian Borneman, Assistant Fire Chief, Fire Department, Town of Merrimack, NH
- Michael Currier, Fire Chief, Fire Department, Town of Merrimack, NH
- Mark Doyle, Chief of Police, Police Department, Town of Merrimack, NH
- Michael Dudash, Police Captain, Police Department, Town of Merrimack, NH
- Ron Miner, Superintendent, Merrimack Village District
- Richard Pierson, Assistant Fire Chief, Fire Department, Town of Merrimack, NH
- Donna Pohli, Assistant Planner, Community Development Department, Town of Merrimack, NH
- Rick Seymour, Director, Department of Public Works, Town of Merrimack, NH

NRPC staff met with the Merrimack Hazard Mitigation Team for a series of 4 meetings in order to prepare the Merrimack Hazard Mitigation Plan Update 2015. Agendas from these meetings appear in the Appendix to this Plan. In between meetings, NRPC worked directly with Merrimack Hazard Mitigation Team members to obtain additional information needed to write the Plan.

The primary differences between the 2015 Plan and the 2010 Plan are 1) preparedness actions are not included in the 2015 Plan, 2) man-made hazards are not included in the 2015 Plan, and 3) Fluvial Erosion is included as a hazard in the 2015 Plan.

Section 1.2 ~ Involvement of Neighboring Communities and Local/Regional Agencies

At the first Hazard Mitigation Team meeting, held on October 23, 2013, the group discussed who should be invited to participate on the planning team that was not currently represented. It was determined that the current Team provided adequate representation and no additional members were necessary. The Team also discussed who should be informed about the Plan, such as neighboring communities, local and regional agencies involved in hazard mitigation, agencies with authority to regulate development, and others. It was concluded that the following entities should be informed of the Plan update:

- American Red Cross, Ashley Pushkarewicz, Emergency Services Director, Nashua, NH

- Anheuser-Busch Inc, Kris Scholl, Merrimack, NH
- BAE Systems, Christine Gillis, Facilities and EH&S Department, Merrimack, NH
- City of Nashua, NH, David Deane, President, Board of Aldermen
- Daniel Webster College, Robert E. Myers, Nashua, NH
- Dartmouth-Hitchcock, Doris Dowell, Office Manager, Merrimack, NH
- Fidelity Investments, Facilities Department, Merrimack, NH
- Homeland Security and Emergency Management, Danielle Morse, Field Representative, Concord, NH
- Jones Chemical, Brian Danforth, Merrimack, NH
- Manchester-Boston Regional Airport, Mark P. Brewer, Manchester, NH
- Nashua Airport Authority, Royce N. Rankin, Jr. Nashua, NH
- Thomas More College, Dr. William Edmund Fahey, Merrimack, NH
- Town of Amherst, NH, George Infanti, Chairman, Board of Selectmen
- Town of Bedford, NH, Mike Izbicki, Chairman, Board of Selectmen
- Town of Litchfield, NH, Frank Byron, Chairman, Board of Selectmen

A copy of the letter that was sent to these entities appears in the Appendix to this Plan.

The update of this Plan included the incorporation of Fluvial Erosion Hazard data, which had not previously been available. As a result, additional efforts were made to involve neighboring communities and local and regional agencies involved in hazard mitigation. NRPC staff met with the Souhegan River Local Advisory Committee on January 17, 2013 to discuss the fluvial erosion hazard study and how the results would be incorporated into local hazard mitigation plan updates. NRPC staff held a second meeting with the Souhegan River Local Advisory Committee on November 20, 2014 to present the final results of the fluvial erosion hazard study and draft hazard mitigation plans. Agendas from these meetings appear in the Appendix to this Plan.

At the outset of this project, NRPC staff met with the Merrimack Town Council on August 15, 2013 to present on the hazard mitigation plan update process and discuss how the fluvial erosion hazard data would be incorporated into the plan update. NRPC staff made a second presentation to the Merrimack Town Council on November 6, 2014 to discuss the results of the fluvial erosion hazard study and the options available to community officials to use the fluvial erosion hazard zones as a public safety tool. Agendas and handouts from these meetings appear in the Appendix to this Plan. The Merrimack Planning Board was given opportunity to provide input on this Plan through the participation of Donna Pohli, Assistant Planner, who served on the Hazard Mitigation Team and was a liaison to the Planning Board.

Section 1.3 ~ Public Participation

During the first Hazard Mitigation Team meeting, held on October 23, 2013, the Team brainstormed all

the methods currently employed to notify the public of Town meetings and news. These methods include the Town's website (http://www.merrimacknh.gov/), Merrimack Police Department Twitter account (https://twitter.com/MerrimackPD), Merrimack Police Department Facebook account (https://www.facebook.com/pages/Merrimack-Police-Department/104950052912992), and local cable access television (http://merrimacktv.com/). The Team determined that these methods should also be used to encourage public participation in the Hazard Mitigation Plan update process. In addition, announcements were made at various televised Town Council meetings regarding the update process. There was no public response to provide input to the Merrimack Hazard Mitigation Plan Update 2015 process.

NRPC staff also developed a webpage for the Merrimack Hazard Mitigation Plan Update 2015 (http://www.nashuarpc.org/energy-environmental-planning/hazard-mitigation-planning/), which allows members of the public to participate in the update process even if they cannot attend meetings. The webpage was updated throughout the planning process and includes the 2010 Merrimack Hazard Mitigation Plan, 2015 Hazard Mitigation Plan Outline, and Hazard Mitigation Plan Review Checklist. It also provides meeting times, locations, agendas, and homework assignments. The Town of Merrimack's website links to this webpage. The Nashua Regional Planning Commission will keep the website active and will add information about ongoing updates over the next 5 years. A screen shot of the website appears in the Appendix to this Plan.

In addition, NRPC staff organized and facilitated two watershed wide public workshops in the Souhegan River Watershed in order to provide information to residents about the fluvial erosion hazard study and the hazard mitigation plan updates. The Souhegan River Watershed includes the New Hampshire towns of Merrimack, Bedford, Goffstown, New Boston, Amherst, Mont Vernon, Lyndeborough, Milford, Brookline, Wilton, Greenfield, Temple, Mason, Greenville, and New Ipswich. These workshops were advertised through a variety of media, including announcements in NRPC's electronic newsletter, fliers in the communities, ads in the Milford Cabinet and Merrimack Journal, and emails to Conservation Commission members in the watershed. The first workshop was held on May 22, 2013 just prior to the start of the fluvial erosion field assessments. The second workshop was held on September 11, 2014 after the data collection was complete. Staff members from NH Dept. of Environmental Services and Field Geology Services were present at both workshops to answer questions from the public. Both meetings were well attended; 22 members of the public attended the May 22, 2013 workshop and 26 members of the public attended the September 11, 2014 workshop. Advertisements from both workshops can be found in the Appendix to this Plan.

Section 1.4 ~ Existing and Potential Authorities, Policies, Programs, and Resources

At the first Hazard Mitigation Team meeting, held on October 23, 2013, the Team discussed Merrimack's existing authorities, policies, programs, and resources related to hazard mitigation and its ability to expand and improve on these. The purpose of this discussion was to determine the ability of the Town to implement its hazard mitigation strategies and to identify potential opportunities to enhance specific

policies, programs, or projects. The evaluation of Merrimack's existing authorities, policies, programs, and resources includes planning and regulatory capabilities, emergency management capabilities, floodplain management capabilities, administrative and technical capabilities, and fiscal capabilities. Each of these areas provides an opportunity to integrate hazard mitigation principles and practices into the local decision making process.

Planning and Regulatory Capabilities

Planning and regulatory capability is based on the implementation of plans, ordinances, and programs that demonstrate Merrimack's commitment to guiding and managing growth in a responsible manner. The following is a summary of the relevant local plans, ordinances, and programs already in place in the Town of Merrimack. Each one should be considered as an available mechanism for incorporating the recommendations of the Merrimack Hazard Mitigation Plan Update 2015.

- Flood Hazard Conservation District—includes all Special Flood Hazard Areas designated by FEMA in its "Flood Insurance Study for the County of Hillsborough, NH" with an effective date of September 25, 2009, together with the associated Flood Insurance Rate Maps dated September 25, 2009.
- Wetlands Conservation District—this district limits construction in wetlands soils, wetlands, and buffer areas.
- Stormwater Management Standards—designed to protect water quality in the Town. Prior to any disturbance, the responsible party is required to submit a SWMP to the Community Development Department for any tracts of land that results in a total disturbance of 20,000 of more square feet of land.
- 2013-2020 Capital Improvement Program—6 year plan that outlines proposed capital expenditures from municipal departments, school board, library, and water district. Planning Board defines capital expenditures as the purchase, construction, or improvement of land, buildings, infrastructure, or equipment having an associated cost of $100,000 or more and an estimated useful life of at least 7 years.
- Zoning Ordinance and Building Code—revised September 11, 2014
- Subdivision and Site Plan Regulations
- 2013 Master Plan Update—adopted January 7, 2014
- National Flood Insurance Program

Emergency Management Capabilities

Hazard mitigation is a key component of emergency management, along with preparedness, response, and recovery. Opportunities to reduce potential losses through mitigation practices are typically implemented before a hazard event occurs, such as enforcement of policies to regulate development that is vulnerable to hazards due to its location or design. Existing emergency management capabilities for the Town of Merrimack include:

Emergency Management Plans

- Merrimack Hazard Mitigation Plan 2010—this document provides a guide for the community to reduce the impact of natural hazards on its residents and the built environment. It addresses natural hazards in the Town, previous occurrences of these hazards, the probability of future hazard events, and the vulnerability of Merrimack's critical facilities to these hazards. The Hazard Mitigation Plan also identifies and prioritizes mitigation actions to reduce Merrimack's vulnerability to natural hazards.
- Merrimack Emergency Response Plan—this document outlines responsibilities and the means by which resources are deployed during and following an emergency or disaster, updated in 2013.

Emergency Management Departments, Facilities, Personnel, and Volunteers

- Merrimack Fire and Rescue Department—responds to all types of incidents including fires, automobile accidents, medical emergencies, hazardous materials response, and technical rescues. In addition, the Department promotes emergency preparedness, fire prevention, building code enforcement, emergency management, health division and other life safety programs.
- Merrimack Police Department
- CERT Team—organized through Police Department, primarily involved with vaccinations and public health issues
- Cooperation with City of Nashua Emergency Management—Merrimack and Nashua emergency management teams meet quarterly regarding emergency management and public health issues, all Nashua alerts (ex. storms, Red Cross, public health) are also sent to Merrimack.
- Souhegan Valley Mutual Aid, Border Area
- Police Mutual Aid—Hillsborough County, Londonderry, State Police, National Guard

Emergency Management Communications

- Nixle—connects public safety agencies to Merrimack residents via text, web, and email
- 411 for School subscribers
- Merrimack Police Department Twitter and Facebook accounts—emergency management announcements
- Local access TV—emergency management announcements
- Merrimack Town website—emergency management announcements and education
- Regional communications system, total interoperability of radio, officers have portable radios, interoperability with Mutual Aid, BAE interoperable system in command vehicle.

Floodplain Management Capabilities

The Town of Merrimack participates in the National Flood Insurance Program (NFIP). This provides full insurance coverage based on risk as shown on detailed Flood Insurance Rate Maps (FIRMs). Merrimack joined the NFIP on July 16, 1979. As a participant in the NFIP, communities must agree to adopt a floodplain management ordinance and enforce the regulations found in the ordinance. Merrimack has adopted the "Flood Hazard Conservation District," found in Section 2.02.8 of the Merrimack Zoning

Ordinance and Building Code. The Flood Hazard Conservation District includes all Special Flood Hazard Areas designated by FEMA in its "flood Insurance Study for the County of Hillsborough, NH," with an effective date of September 25, 2009, together with the associated Flood Insurance Rate Maps dated September 25, 2009.

Additional information on the Flood Hazard Conservation District and Merrimack's participation in the NFIP can be found in Section 3.7 of this Plan.

Administrative and Technical Capabilities

Merrimack's ability to develop and implement mitigation projects, policies, and programs is closely related to the staff time and resources it allocates to that purpose. Administrative capability can be improved by coordinating across departments and integrating mitigation planning into existing Town procedures. The following departments, boards, and personnel are critical to Merrimack's hazard mitigation administrative and technical capabilities:

- Planning Board
- Planning Staff
- Building Inspector
- Building Official
- Health Officials
- Fire Department—FEMA ICS 300-700 trained
- Police Department—FEMA ICS 300-700 trained
- Department of Public Works
- Town Administrator
- Town Council
- Zoning Board
- Budget Committee

Fiscal Capabilities

In addition to administrative and technical capabilities, the ability of the Town of Merrimack to implement mitigation actions is closely associated with the amount of money available for these projects. Mitigation actions identified in this Plan, including those in Table 12—Implementation and Administration, may utilize the following funding sources:

- State and Federal Grants, including, but not limited to:
  - Congestion Mitigation and Air Quality (CMAQ) Program—this program is administered by the Federal Highway Administration and was implemented to support surface transportation projects and related efforts that contribute to air quality improvements and provide congestion relief.
  - FEMA Hazard Mitigation Grant Program—the Hazard Mitigation Grant Program provides grants to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the Program is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster.

- FEMA Pre-Disaster Mitigation Program—the Pre-Disaster Mitigation Program provides funds for hazard mitigation planning and the implementation of mitigation projects prior to a disaster.
- Community Development Block Grant Program—the Community Development Block Grant (CDBG) program, administered through the US Department of Housing and Urban Development, provides communities with resources to address a wide range of unique community development needs, including Disaster Recovery Assistance. HUD provides flexible grants to help cities, counties, and States recover from Presidentially declared disasters, especially in low-income areas, subject to availability of supplemental appropriations.
- NH Department of Transportation Bridge Aid Program

- Capital Improvements Plan
  - The Merrimack Planning Board was directed as a result of the 1984 Town Meeting to prepare and maintain a six-year capital improvements program (CIP) to aid the Budget Committee in its consideration of annual budgets.
  - RSA 674:7 requires municipal departments, the school board, the library, and the water district to submit statements of proposed capital expenditures to the Planning Board. For CIP purposed, the Planning Board defines capital expenditure as the purchase, construction, or improvement of land, buildings, infrastructure, or equipment having an associated cost of $100,000 or more and an estimated useful life of at least seven years.

Summary and Analysis of Merrimack's Existing Authorities, Policies, Programs, and Resources

Measures of Effectiveness are defined as follows:

- Excellent—the existing program works as intended and is exceeding its goals
- Good—the existing program works as intended and meets its goals
- Average—the existing program works as intended but could be improved to meet higher standards
- Poor—the existing program does not work as intended, often falls short of its goals, and/or may present unintended consequences

Capability	Description	Area of Town Covered	Responsible Entities	Effectiveness	Changes or Improvements Needed
Planning and Regulatory	Flood Hazard Conservation District, Wetlands Conservation District, Stormwater Management Standards, 2013-2020 Capital Improvement Program, Zoning	Entire jurisdiction	Planning Board, Zoning Board, Community Development Department	Good	Ordinances should be reviewed on a regular basis to ensure they are consistent with goals outlined in the Master Plan and Hazard

	Ordinance and Building Code, Subdivision and Site Plan Regulations, 2013 Master Plan, NFIP				Mitigation Plan.
Emergency Management	Plans; Departments, Facilities, Personnel, and Volunteers; Communications	Entire jurisdiction	Merrimack Fire and Rescue, Merrimack Police, CERT Team, City of Nashua Emergency Management, Souhegan Valley Mutual Aid Border Area, Police Mutual Aid	Good	Utilize a variety of communications methods to ensure all residents are educated about emergency preparedness and hazard mitigation measures they can take.
Floodplain Management	Flood Hazard Conservation District, NFIP	Designated Flood Hazard Areas in Merrimack	Merrimack Planning Board	Excellent	No changes or improvements needed.
Administrative and Technical	Planning Dept., Planning Staff, Building Inspector, Building Official, Health Officials, Fire Dept., Police Dept., Public Works, Town Administrator, Town Council, Zoning Board, Budget Committee	Entire jurisdiction	Entities listed in Description	Good	Promote communication across all departments to ensure Hazard Mitigation Plan goals and actions are implemented.
Fiscal	Grant funding, Capital Improvements Program (CIP)	Entire jurisdiction	Town Council, Planning Board, Budget Committee	Good	Hazard mitigation actions should be considered for inclusion in the CIP and departmental budgets. Merrimack's Hazard Mitigation Plan should be updated at least

					every 5 years in order to maintain eligibility for FEMA grants.

Section 1.5 ~ Review and Incorporation of Existing Documents

A number of existing documents were reviewed and incorporated into the Merrimack Hazard Mitigation Plan Update 2015. The Merrimack Zoning Ordinance was used to provide information on where and how the Town builds. This was particularly helpful when mapping critical facilities corridors (Section 3.4). The Merrimack Capital Improvements Plan was used to help document the Town's fiscal capabilities (Section 1.4). The Merrimack Master Plan provided insight on future development patterns (Section 2.1) and helped to inform the analysis and prioritization of mitigation actions (Section 4.3). The Merrimack Emergency Response Plan was also used to inform the analysis and prioritization of mitigation actions. The State of New Hampshire Multi-Hazard Mitigation Plan Update 2013 provided insight when developing the description of natural hazards (Section 3.1), description of previous hazards (Section 3.2), probability of future hazards (Section 3.3), vulnerability by hazard (Section 3.5), and goals to reduce vulnerabilities (Section 4.1). Finally, the City of Nashua's Comprehensive Emergency Management Plan was referenced to write the hazard descriptions used to determine Merrimack's vulnerability by hazard (Section 3.5).

Section 1.6 ~ Updating the Plan

The Town of Merrimack is required to update its Hazard Mitigation Plan at least every five years. In order to monitor, evaluate, and update the Mitigation Strategies identified in Table 12—Implementation and Administration, the Merrimack Hazard Mitigation Team will meet annually. The Merrimack Police Chief is responsible for initiating this review and will consult with members of the Merrimack Hazard Mitigation Team and the community. During this meeting, the Team will identify mitigation actions that can be conducted in the current year as well as mitigation actions that will require budget requests for the following year. These mitigation actions will be monitored throughout the year by the Team.

Changes should be made to the Plan to accommodate projects that have failed or are not considered feasible after an evaluation and review for their consistency with the benefit cost analysis, STAPLEE analysis, timeframe, community's priorities, and funding resources. Mitigation strategies that were not ranked as priorities during the 2015 update should be reviewed as well during the monitoring, evaluation, and update of this Plan to determine feasibility of future implementation. New mitigation actions or plans proposed upon adoption of this Plan should follow the benefit cost and STAPLEE

analysis methods utilized in this Plan to ensure consistency with the adopted Plan and to help the Hazard Mitigation Team evaluate overall potential for success.

In addition to this annual meeting, the Hazard Mitigation Team will meet before, during, and after any hazard occurrence as part of the Town's debriefing exercise. The Hazard Mitigation Plan will be updated following this meeting to reflect changes in priorities and mitigation strategies that have resulted from the hazard event. It is especially important to incorporate updates within one year after a Presidential Disaster Declaration.

The Town of Merrimack will utilize its website, local cable channel, and existing social media outlets, including Facebook and Twitter to notify members of the public about the annual Hazard Mitigation Plan Update meeting and to involve them in the update process. Any public input that is received will be incorporated into the Plan update. In addition, following its annual meeting, the Hazard Mitigation Team will report the results of its update process to the Merrimack Town Council. The Town Council meetings are open to the public and are also broadcast on Merrimack public access cable.

CHAPTER 2. CHANGES FROM PREVIOUS PLAN

Section 2.1 ~ Changes in Development

There have been several significant changes in development in Merrimack since the 2010 Hazard Mitigation Plan that have decreased the Town's vulnerability to hazards. A repetitive loss structure on Beacon Drive was moved to reduce the risk of flooding. In addition, several structures on Horseshoe Pond were moved or raised to address flooding. Finally, a number of roads and bridges were raised to decrease their vulnerability to flooding.

Section 2.2 ~ Progress on Local Mitigation Efforts

The mitigation actions and implementation framework identified in the Merrimack Hazard Mitigation Plan Update 2015 have been revised to reflect progress in local mitigation efforts. Progress has been made on a number of local mitigation efforts, including writing an Evacuation Plan for the Mastricola and High School Campus, adding portable generators at the Town Wells, developing a DPW plan to identify and repair bridges and culverts, and expand municipal water system to the Chelsea Development site.

In order to assess progress on local mitigation efforts, the Hazard Mitigation Team reviewed the actions originally presented in the Merrimack Hazard Mitigation Plan 2010 and determined if they had been completed, deleted, or deferred. Progress on each action and its current priority level were also evaluated to determine if it should continue to be included in the mitigation actions identified in this Plan update.

Table 1—Status of Previous Actions

2010 Mitigation Action	Description	Status	Explanation
Evacuation Plan for the Mastricola and High School Campus	In event of a disaster on Baboosic Lake Road and/or F.E. Everett Turnpike. Add as an addendum to *Emergency Management Plan*	Completed	This is a mitigation action (Emergency Services Protection). The Plan has been completed and practiced.
Acquire Mobile Weather Stations	Provide valuable (life-saving) data to Emergency Responders, the public and government	Deferred	This action has been deferred due to budget issues. Because this is a preparedness action and not a mitigation action, it will not be tracked in future natural hazard mitigation plans.
Mutual Aid Agreements on the Regional level to address Terrorism Issues.	This will involve establishing common frequencies among communications systems in surrounding communities	Completed	Police—agreements are complete with Hillsborough County, Londonderry and NH National Guard; not completely interoperable with Nashua and Manchester. Fire—agreements are in place with Souhegan Valley & Border Area Mutual Aid. Because this addresses manmade hazards and not natural hazards, it will not be tracked in future natural hazard mitigation plans.
Add Portable Generators at Town Wells	Generators, fixed or mobile are proven reliable backup power source and will insure adequate water pressure and volume for fire protection	Completed	Installing generators in Critical Infrastructure and Key Resources is a mitigation action (Emergency Services Protection). However, because this action has been completed it will not be tracked in future natural hazard

2010 Mitigation Action	Description	Status	Explanation
			mitigation plans.
Construct a Northwest Fire Station	Off of Baboosic Lake Road and McQuestion Road	Deferred	This action has been deferred due to budget issues. Because this is a preparedness action and not a mitigation action, it will not be tracked in future natural hazard mitigation plans.
Safety Plan for BotL Gas Company	Meet with the property owners to set up a safety plan with a SCADA intrusion system. Regular inspections and warning signs should be components of this plan	Deferred	This action has been deferred because it is considered a low priority. Because this addresses manmade hazards and not natural hazards, it will not be tracked in future natural hazard mitigation plans.
Evacuation Plan for Entire Town	Develop, and have on file in Emergency Management, an emergency evacuation plan for each facility in Town. Add as an addendum to *Emergency Management Plan.*	Deleted	This is a mitigation action (Emergency Services Protection). This action has been deleted because it is not considered a priority. It will not be tracked in future natural hazard mitigation plans.
DPW Plan to Identify & Repair Bridges & Culverts	Plan established by DPW to identify and repair failing culverts, bridges in disrepair, etc.	Completed	This is a mitigation action (Structural). Although it has been completed, a similar mitigation action has been identified in this Plan Update.
Better Communications System with DOD and Guilford Transportation	Develop a communication system with the Department of Defense and Guilford Transportation to determine what is being transported by train through the Town of Merrimack and when.	Deleted	This action has been deleted because it is not considered a priority. Because this addresses manmade hazards and not natural hazards, it will

2010 Mitigation Action	Description	Status	Explanation
			not be tracked in future natural hazard mitigation plans.
Expand Municipal Water System to Chelsea Development Site	The installation of water service is a requirement for approval. Design and approvals are in place.	Completed	This is a mitigation action (Emergency Services Protection). However, because it has been completed it will not be tracked in future natural hazard mitigation plans.

Section 2.3 ~ Changes in Priorities

Many of the "mitigation" actions identified in Merrimack's 2010 Hazard Mitigation Plan were actually preparedness actions. While preparedness actions are important, the Merrimack Hazard Mitigation Plan Update 2015 will focus exclusively on mitigation actions. Therefore, only true mitigation actions from the 2010 Plan will be addressed here.

The STAPLEE scoring system in the 2010 Merrimack Hazard Mitigation Plan was different from the STAPLEE scoring system used in the 2015 update. This makes it difficult to analyze changes in mitigation action priority levels by comparing STAPLEE scores. As such, Table 2 also notes whether the action falls within the top 50% or bottom 50% of all mitigations actions identified in the plan.

The following mitigation action dropped in priority level from the 2010 Plan to the 2015 Plan: evacuation plan for the Mastricola and High School Campus, portable generators at town wells, expansion of municipal water to Chelsea Development, and evacuation plan for entire town.

The following mitigation action rose in priority level from the 2010 Plan to the 2015 Plan: DPW Plan to identify and repair bridges and culverts.

Table 2—Changes in Mitigation Priorities

2010 Mitigation Action	Current Status	Priority Level in 2010 Plan	Priority Level in 2015 Plan
Evacuation Plan for the Mastricola and High School Campus	Completed	STAPLEE Score = 21 Rank = 1 out of 12 Top 50% of all preparedness and	This action has been completed and is no longer considered a priority. A similar action was not identified in the 2015

2010 Mitigation Action	Current Status	Priority Level in 2010 Plan	Priority Level in 2015 Plan
		mitigation actions.	Plan update.
Add Portable Generators at Town Wells	Completed	STAPLEE Score = 20 Rank = 4 out of 12 Top 50% of all preparedness and mitigation actions.	This action has been completed and is no longer considered a priority. A similar action was not identified in the 2015 Plan update.
DPW Plan to identify and repair bridges and culverts	Completed	STAPLEE Score = 18 Rank = 9 out of 12 Bottom 50% of all preparedness and mitigation actions.	STAPLEE Score = 9 Rank = 2 out of 8 Top 50% of all preparedness and mitigation actions.
Expand Municipal Water System to Chelsea Development Site	Completed	STAPLEE Score = 17 Rank = 12 out of 12 Bottom 50% of all preparedness and mitigation actions.	This action has been completed and is no longer considered a priority. A similar action was not identified in the 2015 Plan update.
Evacuation Plan for Entire Town	Deleted	STAPLEE Score = 19 Rank = 8 out of 12 Bottom 50% of all preparedness and mitigation actions.	This action has been deleted because it is no longer considered a priority. A similar action was not identified in the 2015 Plan update.

CHAPTER 3. HAZARD IDENTIFICATION AND RISK ASSESSMENT

Section 3.1 ~ Description of Natural Hazards

The Town of Merrimack is susceptible to a variety of natural hazards, which are outlined in Table 3. For each hazard type, the hazard location within the Town, extent, and impact are also noted. Extent refers to how bad the hazard can be; it is not the same as location. Examples of extent include potential wind

speed, depth of flooding, and existing scientific scales (ex. Fujita Tornado Damage Scale). Impact refers to damages or consequences resulting from the hazard.

Table 3—Natural Hazards in Jurisdiction

Hazard Type	Hazard Location within Jurisdiction	Hazard Extent	Impact
Drought	Entire jurisdiction.	NH DES Drought Management Plan: • Level 1—Alert, 4 month cumulative precipitation less than 65% of normal for the period • Level 2—Warning, 6 month cumulative precipitation less than 65% of normal for the period • Level 3—Emergency, 12 month cumulative precipitation less than 75% of normal for the period • Level 4—Disaster, not quantified	Loss of crops. Inadequate quantity of drinking water. Loss of water for fire protection. Increased risk of fire. Loss of natural resources.
Earthquake	Entire jurisdiction.	Richter Scale: • <3.4—detected only by seismometers • >8—total damage, surface waves seen, objects thrown in air For full definitions of Richter Scale, see Section 3.5 Vulnerability by Hazard	Structural damage or collapse of buildings. Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, municipal communications, 911 communications, radio system. Loss of water for fire protection. Increased risk of fire (gas break). Risk to life, medical

Hazard Type	Hazard Location within Jurisdiction	Hazard Extent	Impact
			surge.
Extreme Temperatures	Entire jurisdiction.	Extreme heat—period of 3 consecutive days when air temperature reaches 90°F or higher on each day. Extreme cold—extended exposure to typical NH winter weather without heat or shelter; period of 3 consecutive days when air temperature is 0°F or lower on each day.	Overburdened power systems may experience failures due to extreme heat. Shortages of heating fuel in extreme cold due to high demand. Medical surge. Loss of municipal water supply for drinking water and fire protection due to freezing temperatures.
Flooding	Floodplains cover approximately 12.7% of Merrimack—9.1% of Merrimack is located in 1% Floodplain and 3.6% of Merrimack is located in the 0.2% Floodplain. The Island Drive area of Merrimack is particularly prone to flooding.	FEMA flood probabilities: • 1% possibility per year • 0.2% possibility per year State of NH Dam Hazard Potential Classification system (for flooding resulting from dam/levee failure): • Class S—significant hazard • Class H—high hazard • Class L—low hazard • Class NM—non-menace For full definitions of Dam Hazard Classes, see Section 3.5 Vulnerability by Hazard	Water damage to structures and their contents. Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, municipal communications, 911 communications, radio system. Environmental hazards resulting from damage. Isolation of neighborhoods resulting from flooding.
Fluvial Erosion	Route 3, Baboosic Brook and McGaw	Stream Sensitivity Rating:	Physical loss of land.

Hazard Type	Hazard Location within Jurisdiction	Hazard Extent	Impact
	Bridge, erosion around bridge. Bedford Road bridge, Wire Road bridge, flooding over approaches to bridge, erosion around road bed. Fluvial Erosion Hazard Zones are found primarily around Baboosic Brook, with Extreme sensitivity zones located east of Loop Road, and Very High sensitivity zones located Whispering Pines Lane and Daniel Webster Highway.	• Low • Moderate • High • Very High • Extreme For full definitions of Stream Sensitivity Ratings, see Section 3.5 Vulnerability by Hazard	Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, municipal communications, 911 communications, radio system. Water damage to structures and their contents. Environmental hazards resulting from damage. Isolation of neighborhoods resulting from damaged transportation infrastructure.
Hurricane/Severe Wind	Entire jurisdiction.	Saffir-Simpson Hurricane Wind Scale: • Category 1—sustained winds 74-95 mph • Category 2—sustained winds 96-110 mph • Category 3—sustained winds 111-129 mph • Category 4—sustained winds 130-156 mph • Category 5—sustained winds 157 mph or higher	Wind damage to structures and trees. Water damage to structures and their contents. Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, municipal communications, 911 communications, radio system. Environmental hazards resulting from damage. Isolation of neighborhoods resulting from flooding. Water pressure, quality, and capacity issues

Hazard Type	Hazard Location within Jurisdiction	Hazard Extent	Impact
			impacting fire protection. Loss of natural resources.
Severe Thunderstorm/Lightning	Entire jurisdiction. Areas particularly prone to lightning strikes include parks, camps, and open fields in Merrimack as well as Harris Pond, Thomas More College, Manchester St, Police Department, Society Hill, and Maple Ridge.	Heavy rainfall, high winds, lightning, tornados, downbursts, fires.	Smoke and fire damage to structures and property. Disruption to power lines, municipal communications, and 911 communications. Damage to critical electronic equipment. Injury or death to people involved in outdoor activity.
Severe Winter Weather	Entire jurisdiction.	Depth of snow in a given time frame (ex. 2 or more inches per hour over a 12 hour period). Blizzard—violent snowstorm with minimum winds of 35 mph and visibility less than ¼ mile for 3 hours. Ground snow load factor. Ice Storm—Sperry-Piltz Ice Accumulation Index: • 0—little impact • 5—catastrophic damage to exposed utility systems For full definitions of Sperry-Plitz Ice Accumulation Index, see Section 3.5	Disruption to road network. Damage to trees municipal communications, and 911 communications. Structural damage to roofs/collapse. Increase in CO, other hazards.

Hazard Type	Hazard Location within Jurisdiction	Hazard Extent	Impact
		Vulnerability by Hazard	
Tornado/Downburst	Entire jurisdiction.	Fujita Tornado Damage Scale: • F0—winds <73 mph • F1—winds 73-112 mph • F2—winds 113-157 mph • F3—winds 158-206 mph • F4—winds 207-260 mph • F5—winds 261-318 mph	Wind damage to structures and trees. Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, municipal communications, 911 communications, radio system. Environmental hazards resulting from damage. Medical surge. Loss of natural resources.
Wildfire	Western portions of Merrimack are most susceptible to wildfire along with areas around railroad tracks and power lines, Wildcat Falls Park, Horsehill Nature Preserve, and Grater Woods Nature Preserve.	NWCG Fire Size Classification: • A—greater than 0 but less than or equal to 0.25 acres • B—0.26 to 9.9 acres • C—10.0 to 99.9 acres • D—100-299 acres • E—300 to 999 acres • F—1,000 to 4,999 acres • G—5,000 to 9,999 acres • H—10,000 to 49,999 acres • I—50,000 to 99,999 acres • J—100,000 to 499,999 acres • K—500,000 to 999,999 acres • L—1,000,000+ acres	Smoke and fire damage to structures in wild land/urban interface. Damage to habitat. Impacts to air quality. Impact to roadways. Loss of natural resources.

Section 3.2 ~ Description of Previous Hazards

The first step in determining the probability of future hazard events in the Town of Merrimack is to examine the location, extent, and impact of previous hazards. If a hazard event has not occurred within Merrimack but has occurred in the region it is also noted.

Table 4—Previous Occurrences of Hazards in Jurisdiction

Hazard Type	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
Drought	1960-1969	Entire jurisdiction	Long term drought—9 years of less than normal precipitation	Farms had minimal grass for grazing animals and poor crops. Wells went dry for 2 consecutive years in mid-1960s.
Drought	1999	Entire jurisdiction	Level 2—Warning. Drought warning issued on June 29, 1999.	Damage to crops. Low water levels in dug wells.
Drought	March 2002	Entire jurisdiction	Level 3—Emergency. First time Level 3 Drought Impact Level had been declared.	Damage to crops. Low water levels in dug wells.
Earthquake	There have been no earthquakes centered in Merrimack to date.	Earthquakes noted below were centered in NH and had a magnitude of 3.0 or greater.		
Earthquake	March 18, 1926	Manchester, NH	No historic data on extent	Intensity V effects observed in Amherst, Lyndeborough, Manchester, Mason, and Wilton.
Earthquake	December 20, 1940	Lake Ossipee, NH	Magnitude 5.5 on Richter Scale	No damage in Merrimack
Earthquake	December 24, 1940	Lake Ossipee, NH	Magnitude 5.5 on Richter Scale	No damage in Merrimack
Earthquake	December 4, 1963	Laconia, NH (43.6 latitude, -71.5 longitude)	Magnitude 3.7 on Richter Scale	No damage in Merrimack
Earthquake	June 28, 1981	Sanbornton, NH (43.56 latitude, -71.56 longitude)	Magnitude 3.0 on Richter Scale	No damage in Merrimack
Earthquake	January 19, 1982	Sanbornton, NH (43.5 latitude, -71.6	Magnitude 4.7 on Richter Scale	No damage in Merrimack

Hazard Type	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
		longitude)		
Earthquake	October 25, 1986	Northfield, NH (43.399 latitude, -71.59 longitude)	Magnitude 3.9 on Richter Scale	No damage in Merrimack
Earthquake	October 20, 1988	Milan, NH (44.539 latitude, -71.158 longitude)	Magnitude 3.9 on Richter Scale	No damage in Merrimack
Earthquake	November 22, 1988	Milan, NH (44.557 latitude, -71.183 longitude)	Magnitude 3.2 on Richter Scale	No damage in Merrimack
Earthquake	April 6, 1989	Berlin, NH (44.511 latitude, -71.144 longitude)	Magnitude 3.5 on Richter Scale	No damage in Merrimack
Earthquake	October 6, 1992	Canterbury, NH (43.324 latitude, -71.578 longitude)	Magnitude 3.4 on Richter Scale	No damage in Merrimack
Earthquake	June 16, 1995	Lyman, NH (44.286 latitude, -71.915 longitude)	Magnitude 3.8 on Richter Scale	No damage in Merrimack
Earthquake	August 21, 1996	Bartlett, NH (44.184 latitude, -71.352 longitude)	Magnitude 3.8 on Richter Scale	No damage in Merrimack
Earthquake	January 27, 2000	Raymond, NH (43.00 latitude, -71.18 longitude)	Magnitude 3.0 on Richter Scale	No damage in Merrimack
Earthquake	September 26, 2010	Boscawen, NH (43.2915 latitude, -71.6568 longitude)	Magnitude 3.4 on Richter Scale	No damage in Merrimack
Earthquake		Earthquakes noted below were centered outside of NH but were felt by NH municipalities.		
Earthquake	November 18, 1929	Grand Banks, Newfoundland	Magnitude 7.2 on Richter Scale	No damage in Merrimack
Earthquake	November 1, 1935	Timiskaming, Canada	Magnitude 6.25 on Richter Scale	No damage in Merrimack
Earthquake	June 15, 1973	Near Canadian/NH border	Magnitude 4.8 on Richter Scale	No damage in Merrimack
Earthquake	June 23, 2010	Buckingham, Quebec, Canada	Magnitude 5.0 on Richter Scale	No damage in Merrimack
Earthquake	August 23, 2011	Washington, DC	Magnitude 5.8 on Richter Scale	No damage in Merrimack
Earthquake	October 16, 2012	Hollis Center, ME	Magnitude 4.0 on Richter Scale	No damage in Merrimack
Extreme Temperature (Cold)	January 16-20, 2000	Entire jurisdiction	5 consecutive days of minimum temperatures at or below 0°F:	No known impact in Merrimack

Hazard Type	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
			• 1/16/00: -3°F • 1/17/00: -2°F • 1/18/00: -5°F • 1/19/00: -6°F • 1/20/00: -4°F	
Extreme Temperature (Cold)	January 28-30, 2000	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 1/28/00: -6°F • 1/29/00: -2°F • 1/30/00: -4°F	No known impact in Merrimack
Extreme Temperature (Cold)	January 18-20, 2003	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 1/18/00: -9°F • 1/19/00: -11°F • 1/20/00: -11°F	No known impact in Merrimack
Extreme Temperature (Cold)	January 28-31, 2003	Entire jurisdiction	4 consecutive days of minimum temperatures at or below 0°F: • 1/28/03: -9°F • 1/29/03: -5°F • 1/30/03: -0°F • 1/31/03: -0°F	No known impact in Merrimack
Extreme Temperature (Cold)	February 13-17, 2003	Entire jurisdiction	5 consecutive days of minimum temperatures at or below 0°F: • 2/13/03: -3°F • 2/14/03: -11°F • 2/15/03: -10°F • 2/16/03: -7°F • 2/17/03: -2°F	No known impact in Merrimack
Extreme Temperature (Cold)	February 26-28, 2003	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 2/26/03: -4°F • 2/27/03: -6°F • 2/28/03: -1°F	No known impact in Merrimack
Extreme Temperature (Cold)	January 9-12, 2004	Entire jurisdiction	4 consecutive days of minimum temperatures at or below 0°F: • 1/9/04: -7°F • 1/10/04: -8°F	No known impact in Merrimack

Hazard Type	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
			• 1/11/04: -8°F • 1/12/04: -7°F	
Extreme Temperature (Cold)	January 14-17, 2004	Entire jurisdiction	4 consecutive days of minimum temperatures at or below 0°F: • 1/14/04: -10°F • 1/15/04: -10°F • 1/16/04: -12°F • 1/17/04: -9°F	Wind chills of -30°F, 6 fatalities in NH
Extreme Temperature (Cold)	January 24-27, 2004	Entire jurisdiction	4 consecutive days of minimum temperatures at or below 0°F: • 1/24/04: -4°F • 1/25/04: -6°F • 1/26/04: -6°F • 1/27/04: -0°F	No known impact in Merrimack
Extreme Temperature (Cold)	January 18-25, 2005	Entire jurisdiction	8 consecutive days of minimum temperatures at or below 0°F: • 1/18/05: 0°F • 1/19/05: -8°F • 1/20/05: -3°F • 1/21/05: -5°F • 1/22/05: -12°F • 1/23/05: -9°F • 1/24/05: 0°F • 1/25/05: -1°F	No known impact in Merrimack
Extreme Temperature (Cold)	January 28-30, 2005	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 2/28/05: -1°F • 2/29/05: -7°F • 2/30/05: -5°F	No known impact in Merrimack
Extreme Temperature (Cold)	January 16-18, 2009	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 1/16/09: -16°F • 1/17/09: -16°F • 1/18/09: -9°F	No known impact in Merrimack
Extreme Temperature (Cold)	January 25-27, 2009	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 1/25/09: -7°F	No known impact in Merrimack

Hazard Type	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
			• 1/26/09: -7°F • 1/27/09: -5°F	
Extreme Temperature (Cold)	January 15-18, 2011	Entire jurisdiction	4 consecutive days of minimum temperatures at or below 0°F: • 1/15/11: -6°F • 1/16/11: -5°F • 1/17/11: 0°F • 1/18/11: -2°F	No known impact in Merrimack
Extreme Temperature (Cold)	January 23-27, 2011	Entire jurisdiction	5 consecutive days of minimum temperatures at or below 0°F: • 1/23/05: -5°F • 1/24/05: -10°F • 1/25/05: -9°F • 1/26/05: -3°F • 1/27/05: -2°F	No known impact in Merrimack
Extreme Temperature (Cold)	January 15-17, 2012	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 1/15/12: -2°F • 1/16/12: -2°F • 1/17/12: 0°F	No known impact in Merrimack
Extreme Temperature (Heat)	May 3-5, 2001	Entire jurisdiction	3 consecutive days of temperatures above 90°F: • 5/3/01—93°F • 5/4/01—92°F • 5/5/01—92°F	No known impact in Merrimack
Extreme Temperature (Heat)	June 15-17, 2001	Entire jurisdiction	3 consecutive days of temperatures above 90°F: • 6/15/01—92°F • 6/16/01—95°F • 6/17/01—91°F	No known impact in Merrimack
Extreme Temperature (Heat)	July 22-26, 2001	Entire jurisdiction	5 consecutive days of temperatures above 90°F: • 7/22/01—90°F • 7/23/01—90°F • 7/24/01—92°F • 7/25/01—95°F • 7/26/01—93°F	No known impact in Merrimack
Extreme Temperature (Heat)	August 7-10, 2001	Entire jurisdiction	4 consecutive days of temperatures above 90°F:	No known impact in Merrimack

Hazard Type	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
			• 8/7/01—94°F • 8/8/01—97°F • 8/9/01—96°F • 8/10/01—100°F	
Extreme Temperature (Heat)	July 2-5, 2002	Entire jurisdiction	4 consecutive days of temperatures above 90°F: • 7/2/02—90°F • 7/3/02—95°F • 7/4/02—98°F • 7/5/02—97°F	No known impact in Merrimack
Extreme Temperature (Heat)	July 30-August 2, 2002	Entire jurisdiction	4 consecutive days of temperatures above 90°F: • 7/30/02—90°F • 7/31/02—91°F • 8/1/02—91°F • 8/2/02—93°F	No known impact in Merrimack
Extreme Temperature (Heat)	August 13-20, 2002	Entire jurisdiction	8 consecutive days of temperatures above 90°F: • 8/13/02—94°F • 8/14/02—96°F • 8/15/02—98°F • 8/16/02—95°F • 8/17/02—94°F • 8/18/02—92°F • 8/19/02—94°F • 8/20/02—92°F	No known impact in Merrimack
Extreme Temperature (Heat)	June 25-28, 2003	Entire jurisdiction	4 consecutive days of temperatures above 90°F: • 6/25/03—90°F • 6/26/03—93°F • 6/27/03—92°F • 6/28/03—92°F	No known impact in Merrimack
Extreme Temperature (Heat)	July 5-7, 2003	Entire jurisdiction	3 consecutive days of temperatures above 90°F: • 7/5/03—91°F • 7/6/03—90°F • 7/7/03—91°F	No known impact in Merrimack
Extreme Temperature (Heat)	July 17-19, 2006	Entire jurisdiction	3 consecutive days of temperatures above 90°F: • 7/17/06—90°F • 7/18/06—93°F • 7/19/06—94°F	No known impact in Merrimack
Extreme	August 2-4, 2006	Entire jurisdiction	3 consecutive days	No known impact in

Hazard Type	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
Temperature (Heat)			of temperatures above 90°F: • 8/2/06—96°F • 8/3/06—97°F • 8/4/06—92°F	Merrimack
Extreme Temperature (Heat)	August 16-20, 2006	Entire jurisdiction	5 consecutive days of temperatures above 90°F: • 8/16/09—90°F • 8/17/09—90°F • 8/19/09—91°F • 8/19/09—93°F • 8/20/09—90°F	No known impact in Merrimack
Extreme Temperature (Heat)	July 4-10, 2010	Entire jurisdiction	7 consecutive days of temperatures above 90°F: • 7/4/10—90°F • 7/5/10—90°F • 7/6/10—97°F • 7/7/10—98°F • 7/8/10—97°F • 7/9/10—92°F • 7/10/10—92°F	No known impact in Merrimack
Extreme Temperature (Heat)	July 17-20, 2010	Entire jurisdiction	4 consecutive days of temperatures above 90°F: • 7/17/10—93°F • 7/18/10—93°F • 7/19/10—93°F • 7/20/10—90°F	No known impact in Merrimack
Extreme Temperature (Heat)	August 30-Sept. 3, 2010	Entire jurisdiction	5 consecutive days of temperatures above 90°F: • 8/30/10—92°F • 8/31/10—91°F • 9/1/10—94°F • 9/2/10—95°F • 9/3/10—96°F	No known impact in Merrimack
Extreme Temperature (Heat)	July 21-24, 2011	Entire jurisdiction	4 consecutive days of temperatures above 90°F: • 7/21/11—92°F • 7/22/11—96°F • 7/23/11—101°F • 7/24/11—96°F	No known impact in Merrimack
Extreme Temperature (Heat)	June 21-23, 2012	Entire jurisdiction	3 consecutive days of temperatures above 90°F: • 6/21/12—96°F	No known impact in Merrimack

Hazard Type	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
			• 6/22/12—94°F • 6/23/12—93°F	
Extreme Temperature (Heat)	July 13-16, 2012	Entire jurisdiction	4 consecutive days of temperatures above 90°F: • 7/13/12—92°F • 7/14/12—92°F • 7/15/12—93°F • 7/16/12—91°F	No known impact in Merrimack
Extreme Temperature (Heat)	August 3-6, 2012	Entire jurisdiction	4 consecutive days of temperatures above 90°F: • 8/3/12—91°F • 8/4/12—94°F • 8/5/12—95°F • 8/6/12—93°F	No known impact in Merrimack
Extreme Temperature (Heat)	June 1-3, 2013	Entire jurisdiction	3 consecutive days of temperatures above 90°F: • 6/1/13—93°F • 6/2/13—92°F • 6/3/13—91°F	No known impact in Merrimack
Extreme Temperature (Heat)	July 16-21, 2013	Entire jurisdiction	6 consecutive days of temperatures above 90°F: • 7/16/13—90°F • 7/17/13—91°F • 7/18/13—93°F • 7/19/13—93°F • 7/20/13—96°F • 7/21/13—91°F	No known impact in Merrimack
Flooding	There have been no flooding events caused by dam failure in Merrimack to date.			
Flooding	October 23, 1785	Merrimack River	No historic data on extent	No historic data on impact
Flooding	April 21-24, 1852	Merrimack River	Highest flood stage in 70 years. Flood waters 2 feet lower than 1785 flood.	No historic data on impact
Flooding	1927	Hillsborough County	No historic data on extent	Damage to road network.
Flooding	March 11-21, 1936	Hillsborough County	25-50 year recurrence interval	$133,000,000 in property damage and 77,000 homeless

Hazard Type	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
				throughout New England. Primary impact to structures, infrastructure, and road network. Flooding caused by heavy snowfall totals, heavy rains, and warm weather.
Flooding	1940	Souhegan River, near Central Fire Station	No historic data on extent	Damage to road network.
Flooding	June 1942	Merrimack River	No historic data on extent	Damage to road network.
Flooding	June 1944	Merrimack River	No historic data on extent	Damage to road network.
Flooding	April 1960	Merrimack River	No historic data on extent	Flooding resulting from rapid snow melt and heavy rain. Damage to road network.
Flooding, ice jam	March 10, 1964	Souhegan River	Maximum gage height of 6.06 feet	No data on impact.
Flooding, ice jam	March 19, 1968	Souhegan River	Discharge of 3,800 cfs	No data on impact.
Flooding	July 11, 1973	Hillsborough County	No data on extent available	FEMA Disaster Declaration #399
Flooding, ice jam	March 1977	Souhegan River	No historic data on extent	5 homes flooded.
Flooding, ice jam	March 1977	Baboosic Brook	No historic data on extent	Impact to transportation infrastructure. $80,000 to replace bridge. Town tried unsuccessfully to remove ice with backhoe.
Flooding	July 29-August 10, 1986	Hillsborough County	No data on extent available	FEMA Disaster Declaration #771
Flooding	March 30-April 11, 1987	Hillsborough County	25-50+ year recurrence interval	$4,888,889 in damage in NH. FEMA Disaster Declaration #789. Primary impact to agricultural fields.
Flooding	August 7-11, 1990	Hillsborough County	No data on extent available	$2,297,777 in damage in NH. FEMA Disaster Declaration #876. Primary impact to

Hazard Type	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
				infrastructure.
Flooding	October 20-23, 1996	Hillsborough County	No data on extent available	$2,341,273 in damage in NH. FEMA Disaster Declaration #1144. Primary impact to structures and infrastructure.
Flooding	July 2, 1998	Hillsborough County	No data on extent available	$3,400,000 in damage in NH, 6 counties impacted including Hillsborough. FEMA Disaster Declaration #1231. Primary impact to structures and infrastructure.
Flooding	May 2001	Pennichuck Brook	No data on extent available	NH 101A collapsed on the eastbound side. Traffic impacted for months.
Flooding	October 26, 2005	Hillsborough County	50-100 year recurrence interval	5 counties impacted in NH, including Hillsborough. FEMA Disaster Declaration #1610. Primary impact to structures and infrastructure.
Flooding	May 12-23, 2006	Hillsborough County	As much as 14 inches of rainfall in region. 100-500 year recurrence interval.	7 counties impacted in NH, including Hillsborough. FEMA Disaster Declaration #1643. Primary impact to infrastructure.
Flooding	April 15, 2007	Hillsborough County	100-500 year recurrence interval	$27,000,000 in damages in NH; 2,005 home owners and renters applied for assistance in NH. FEMA Disaster Declaration #1695. Primary impact to structures and infrastructure.
Flooding	September 6-7, 2008	Hillsborough County	50-100 year recurrence interval	$6.90 per capita in damages in

Hazard Type	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
				Hillsborough County. FEMA Disaster Declaration #1799 Primary impact to structures and infrastructure.
Flooding	March 14, 2010	Hillsborough County	50-100 year recurrence interval	$1,880,685 in FEMA public assistance in NH; $1.80 per capita in Hillsborough County. Flooding near Johnson Corner due to undersized culvert. FEMA Disaster Declaration #1913 Primary impact to roads and bridges.
Fluvial Erosion	May 13-14, 2006	Suncook River—Epsom, NH	Avulsion	River channel changed course following heavy rain event, shortening path by ½ mile. Excessive sedimentation downstream.
Fluvial Erosion	August 28, 2011	East Branch Pemigewasset River—Lincoln, NH	Stream bank erosion	Damage to bridge abutments at Loon Mountain Ski Resort during Tropical Storm Irene.
Fluvial Erosion	August 28, 2011	Peabody River—Gorham, NH	Berm breach and stream bank erosion	High flows eroded through a berm and eroded the banks in front of numerous properties during Tropical Storm Irene. Significant damage to White Birch Lane.
Fluvial Erosion	August 28, 2011	Saco River—Harts Location, Bartlett, Conway, NH	Stream bank erosion	Stream bank erosion adjacent to a campground in Harts Location. Erosion of a protective berm in Bartlett.
Fluvial Erosion	July 2-3, 2013	Merriam Brook—	Aggradation	Existing channel

Hazard Type	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
		Surry, NH		path filled in with sediment following heavy rain event, forcing flow to begin creating new path in backyards of two properties.
Hurricane	Great Hurricane of 1938	Hillsborough County	No data on extent available	$12,337,643 total damages (not adjusted for inflation), 13 deaths and 494 injuries in NH. Damage to road network and structures caused by flooding.
Hurricane	August 31, 1954 (Carol)	Hillsborough County	Saffir-Simpson Scale Category 3.	Extensive tree and crop damage.
Hurricane	September 12, 1960 (Donna)	Hillsborough County	Saffir-Simpson Scale Category 3	Water damage to structures due to flooding.
Hurricane	September 27, 1985 (Gloria)	Hillsborough County	Saffir-Simpson Scale Category 2	Damage to trees and power lines from high winds.
Hurricane	August 19, 1991 (Bob)	Hillsborough County	Saffir-Simpson Scale Category 1	FEMA Disaster Declaration #917. Damage to structures, trees, and power lines from high winds.
Hurricane	September 16-18, 1999 (Floyd)	Hillsborough County	Tropical Storm (winds 39-73 mph)	FEMA Disaster Declaration #1305. Primary impact to trees, infrastructure, and road network.
Hurricane	August 28, 2011 (Irene)	Hillsborough County	Tropical Storm (winds 39-73 mph).	Damage to trees and power lines from high winds. Flash floods.
Hurricane	October 26, 2012 (Sandy)	Hillsborough County	Tropical Storm (winds 39-73 mph).	Minimal damage.
Severe Thunderstorm	There has been no significant damage from severe thunderstorms in Merrimack to date.			
Severe Winter	March 11-14, 1888	Entire jurisdiction	30-50 inches of	No historic data on

Hazard Type	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
Weather			snow	impact
Severe Winter Weather	1922	Entire jurisdiction	No historic data on extent	Extreme snow drifts paralyzed road network.
Severe Winter Weather	February 14-15, 1940	Entire jurisdiction	Over 30 inches of snow	Snow and high winds paralyzed road network.
Severe Winter Weather	February 14-17, 1958	Entire jurisdiction	20-33 inches of snow	Primary impact to road network.
Severe Winter Weather	March 18-21, 1958	Entire jurisdiction	22-24 inches of snow	Primary impact to road network.
Severe Winter Weather	March 2-5, 1960	Entire jurisdiction	Up to 25 inches of snow	Primary impact to road network.
Severe Winter Weather	January 18-20, 1961	Entire jurisdiction	Up to 25 inches of snow	Blizzard conditions paralyze road network.
Severe Winter Weather	February 22-28, 1969	Entire jurisdiction	24-98 inches of snow in Central NH	Primary impact to road network. Slow moving storm.
Severe Winter Weather	December 25-28, 1969	Entire jurisdiction	12-18 inches of snow	Primary impact to road network.
Severe Winter Weather	January 19-21, 1978	Entire jurisdiction	Up to 16 inches of snow	Primary impact to road network.
Severe Winter Weather	February 5-7, 1978 (Blizzard of '78)	Entire jurisdiction	25-33 inches of snow	Snow paralyzed road network, trapped commuters in cars, and forced closure of businesses.
Severe Winter Weather	April 5-7, 1982	Entire jurisdiction	18-22 inches of snow	Primary impact to road network.
Severe Winter Weather	March, 1983	Entire jurisdiction	Over 18 inches of snow, 30-40 mph winds	Snow paralyzed road network and forced closure of businesses.
Severe Winter Weather	December 1996	Entire jurisdiction	14 inches of snow	Damage to power lines forces closure of businesses.
Severe Winter Weather	January 7, 1998	Entire jurisdiction	Ice storm, no data on extent available	$12,446,202 in total damages, 1 death and 6 injuries in NH. $17,000,000 in damages to PSNH equipment. FEMA Disaster Declaration #1199. 20 major road closures; 67,586 without power; 2,310 without phone service; 1

Hazard Type	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
				communication tower failure.
Severe Winter Weather	December 11, 2008	Entire jurisdiction	Ice storm, no data on extent available	$10,383,602 in FEMA public assistance in NH; $6.35 per capita in Hillsborough County. FEMA Disaster Declaration #1812 Damage to power and phone lines and trees.
Severe Winter Weather	February 23, 2010	Entire jurisdiction	Snow followed by rainfall between 2-6 inches. Winds over 70 mph.	$6,268,179 in FEMA public assistance in NH; $3.68 per capita in Hillsborough County. FEMA Disaster Declaration #1892 Damage to power and phone lines, trees, and road network. Over 330,000 customers without power state-wide.
Severe Winter Weather	October 29-30, 2011	Entire jurisdiction	15-20 inches of snow.	$3,052,769 in FEMA public assistance in NH; $5.11 per capita in Hillsborough County. FEMA Disaster Declaration #4049 Damage to power and phone lines, trees, and road network.
Severe Winter Weather	February 8-10, 2013	Entire jurisdiction	Snowfall totals of 12-18 inches across region, up to 30 inches in parts of NH. Winds 10-20 mph with gusts up to 40 mph. Visibility less than ¼ mile.	FEMA Disaster Declaration #4105
Tornado	No tornado has originated in Merrimack to-date			

Hazard Type	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
Tornado	July 2, 1961	Northern Hillsborough Co, originated near Weare, NH	Fujita Scale F2	0 fatalities, 0 injuries
Tornado	July 21, 1961	Central Hillsborough Co, originated near New Boston, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	May 9, 1963	Northeastern, Hillsborough Co, originated near Goffstown, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	May 20, 1963	Western Hillsborough Co, originated near Peterborough, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	June 9, 1963	Northeastern Hillsborough Co, originated near Manchester, NH	Fujita Scale F2	0 fatalities, 0 injuries
Tornado	August 28, 1965	Eastern Hillsborough Co, originated near Litchfield, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	July 19, 1966	Southern Hillsborough Co, originated near Amherst, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	July 17, 1968	Central Hillsborough Co, originated near Wilton, NH	Fujita Scale F2	0 fatalities, 0 injuries
Tornado	August 20, 1968	Northeastern Hillsborough Co, originated near Manchester, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	July 19, 1972	Southeastern Hillsborough Co, originated near Hudson, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	July 5, 1984	Western Hillsborough Co, originated near Harrisville, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	July 5, 1984	Southeastern Hillsborough Co, originated near Pelham, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	June 16, 1986	Western Hillsborough Co, originated near Swanzey, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	July 3, 1997	Central Hillsborough	Fujita Scale F2	0 fatalities, 0 injuries

Hazard Type	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
		Co, originated near Greenfield, NH		
Tornado	May 31, 1998	Western Hillsborough Co, orginated near Antrim, NH	Fujita Scale F2	0 fatalities, 0 injuries
Downburst	July 6, 1999	Merrimack, Grafton, and Hillsborough Co.	Macroburst	2 fatalities, 2 lost roofs, damage to trees and utility infrastructure
Wildfire	May 4, 1942	Fire began in Merrimack then jumped Merrimack River into Litchfield near McQuesten Farms. Fire eventually spread to Nashua and Amherst.	NWCG Fire Size Classification F: 2,000 acres in Merrimack, Litchfield, Nashua, and Amherst	Numerous area fire departments battled the blaze. Many firefighters were injured.
Wildfire	May 8, 1950	2 separate fires roughly 1 mile apart near Wildcat Falls	NWCG Fire Size Classification C: approximately 40 acres	Destruction of commercial property (Art's Garage), large barn, and silo. Death to livestock.
Wildfire	September 1, 2007	Power lines along Route 3 near Pointer Fish and Game Club, Merrimack to Bedford	NWCG Fire Size Classification C: approximately 20 acres	8 day event, no damage to houses
Wildfire	March 22, 2012	Median on the Everett Turnpike, just north of Wire Road overpass.	NWCG Fire Size Classification A	Fire started by cigarette butt, no impact to structures or roadway.
Wildfire	May 4, 2013	Ichabod Drive	NWCG Fire Size Classification B: 1 acre	No damage to structures. Firefighters from Merrimack, Nashua, and Amherst fought fire.

Section 3.3 ~ Probability of Future Hazard Events

After documenting the occurrence of previous hazard events in the Town of Merrimack and the surrounding region, the Hazard Mitigation Team used this information to calculate the annual probability of these events occurring in the future. The first step was to determine how many times a particular hazard had occurred in a given number of years. The number of occurrences was then divided

by the number of years to determine annual probability. For example, if history shows that a particular hazard typically occurs 1 time every 4 years, the annual probability is 25%. Annual probability was calculated twice for each hazard. First, annual probability was calculated since the first recorded historic occurrence of the event. Second, annual probability was calculated based on occurrences since 2000 to reflect potential recent changes in hazard event occurrence rates. The probability of future hazard events for each hazard type in the Town of Merrimack is outlined in Table 5.

Table 5—Probability of Future Hazard Events

Hazard Type	Probability of Future Event	Source
Drought	11 years of drought from 1960 through 2013. 11 events in 54 years = .204 events per year **Annual Probability = 20.4%** 1 year of drought from 2000 through 2013. 1 event in 14 years = .071 **Annual Probability = 7.1%**	NH Dept. of Environmental Services and public input
Earthquake	History shows no known earthquakes centered in Merrimack. However, this hazard is still possible. 6 magnitude 5.0 or greater earthquakes felt in NH from 1929 through 2013. 6 events in 85 years = .071 events per year **Annual Probability = 7.1%** 2 magnitude 5.0 or greater earthquakes felt in NH from 2000 through 2013. 2 events in 14 years = .143	US Geological Survey; Northern California Earthquake Data Center, Advanced National Seismic System http://www.ncedc.org/anss/catalog-search.html

Hazard Type	Probability of Future Event	Source
	events per year **Annual Probability = 14.3%**	
Extreme Temperatures	21 extreme heat events from 2000 through 2013. 21 event in 14 years = 1.5 event per year **Annual Probability = 100%** 16 extreme cold events from 2000 through 2013. 16 event in 14 years = 1.14 event per year **Annual Probability = 100%**	National Climatic Data Center, National Oceanic and Atmospheric Administration http://www.ncdc.noaa.gov/cdo-web/search
Flooding	35 flooding events in Hillsborough County from 1785 through 2013. 35 events in 229 years = .105 events per year **Annual Probability = 15.3%** 6 flooding events in Hillsborough County from 2000 through 2013. 6 events in 14 years = .429 events per year **Annual Probability = 42.9%**	FEMA, local knowledge, and public input
Fluvial Erosion	Because of limited data on previous fluvial erosion events, probability cannot be calculated statistically.	NH Dept. of Environmental Services, local knowledge, and public input

Hazard Type	Probability of Future Event	Source
	Low probability is defined as 0-25% chance of occurrence annually. **Annual Probability = 0-25%**	
Hurricane/Severe Wind	8 hurricanes/tropical storms from 1938 through 2013. 8 events in 76 years = .105 events per year **Annual Probability = 10.5%** 2 hurricanes/tropical storms from 2000 through 2013. 2 events in 14 years = .143 events per year **Annual Probability = 14.3%**	National Weather Service and public input
Severe Thunderstorm/Lightning	Because of limited data on previous severe thunderstorm events, probability cannot be calculated statistically. History shows no occurrences of severe thunderstorms in Merrimack. However, this hazard is still possible and therefore, the probability is low. Low probability is defined as 0-25% chance of occurrence annually. **Annual Probability = 0-25%**	FEMA Mitigation Planning Workshop (Unit 3), local knowledge, and public input

Hazard Type	Probability of Future Event	Source
Severe Winter Weather	19 severe winter weather events from 1888 through 2013. 19 events in 126 years = .151 events per year **Annual Probability = 15.1%** 4 severe winter weather events from 2000 through 2013. 4 events in 14 years = .286 events per year **Annual Probability = 28.6%**	FEMA, local knowledge, and public input
Tornado/Downburst	16 tornados and 1 downburst in Hillsborough Co. from 1961 through 2013. 17 events in 53 years = .321 events per year **Annual Probability = 32.1%** 0 tornados and 0 downbursts in Hillsborough Co. from 2000 through 2013. 0 events in 14 years = 0 events per year **Annual Probability = 0-25%**	Tornado History Project (Joshua Lietz, Storm Prediction Center, National Climatic Data Center) and public input http://www.tornadohistoryproject.com
Wildfire	Because of limited data on previous wildfire events, probability cannot be calculated statistically.	FEMA Mitigation Planning Workshop (Unit 3), local knowledge, and public input

Hazard Type	Probability of Future Event	Source
	Low probability is defined as 0-25% chance of occurrence annually. **Annual Probability = 0-25%**	

Section 3.4 ~ Critical Facilities and their Vulnerability

The next step in determining Merrimack's overall vulnerability was to inventory the Town's community assets and determine what assets would be affected by each type of hazard event. The Hazard Mitigation Team began by reviewing the Merrimack Zoning Ordinance to provide information on where and how the Town builds and to identify the corridors where critical facilities would likely be located. The Team then identified the broad categories of important assets within Merrimack, including critical facilities essential to health and welfare; vulnerable populations, such as children and the elderly; economic assets and major employers; areas of high-density residential and commercial development; and historic, cultural, and natural resources. The Team then further divided the Town's critical facilities into the following categories:

1. **General Occupancy**
    a. Residential
    b. Commercial
    c. Industrial
    d. Agriculture
    e. Religion
    f. Government
    g. Education
2. **Essential Facilities**
    a. Fire Station
    b. Police Station
    c. Department of Public Works
    d. Schools
    e. Emergency Operations Centers
    f. Medical Care Facilities
3. **Transportation Systems**
    a. Highway Systems
    b. Railway Systems
    c. Bus Facilities
    d. Airport Systems

4. **Utility Systems**
    a. Potable Water
    b. Drinking Water
    c. Oil/Propane Facilities
    d. Natural Gas Facilities
    e. Electric Power
    f. Communications
5. **High Potential Hazard Facilities**
    a. Dams/Levees
    b. Nuclear Power Plants
    c. Military
6. **Hazardous Materials Facilities** (http://www2.epa.gov/toxics-release-inventory-tri-program)

The critical facilities within each category appear in the Tables 6.1-6.6 below. Each table includes the critical facility's name, content vulnerability, and locational vulnerability to hazards.

Table 6.1—General Occupancy Critical Facilities

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion*	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Commercial—Home Depot	Potentially large population present		✓			n/a	✓	✓	✓	✓	✓
Commercial—PC Connection	Potentially large population present, located in 1% annual floodplain		✓		✓	n/a	✓	✓	✓	✓	✓
Commercial—Fidelity Corporation	Potentially large population present		✓			n/a	✓	✓	✓	✓	✓
Commercial—Value Added Services	Potentially large population present, located in 0.2% annual floodplain		✓		✓	n/a	✓	✓	✓	✓	✓
Commercial—Merrimack Outlets	Potentially large population present		✓			n/a	✓	✓	✓	✓	✓
Commercial—Holiday Inn Express	Potentially large population present		✓			n/a	✓	✓	✓	✓	✓

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion*	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Commercial—Days Inn	Potentially large population present		✓			n/a	✓	✓	✓	✓	✓
Commercial—Merrimack Inn & Suites	Potentially large population present		✓			n/a	✓	✓	✓	✓	✓
Commercial—Atrium Medical	Potentially large population present, located in 1% annual floodplain		✓		✓	n/a	✓	✓	✓	✓	✓
Commercial—Cinemagic	Potentially large population present		✓			n/a	✓	✓	✓	✓	✓
Education—Thomas Moore College	Potentially large population present		✓			n/a	✓	✓	✓	✓	✓
Government—NH DOT Turnpike Maintenance Facility	Backup fuel for Merrimack		✓			n/a	✓	✓	✓	✓	✓
Government—Adult Community Center	Potentially large population present, shelter for up to 50		✓			n/a	✓	✓	✓	✓	✓
Government—Merrimack Public Library	Potentially large population present, official records and documents		✓			n/a	✓	✓	✓	✓	✓
Government—Merrimack Town Hall complex	Potentially large population present, official records and documents		✓			n/a	✓	✓	✓	✓	✓
Government—Merrimack District Court	Potentially large population present, official records and documents		✓			n/a	✓	✓	✓	✓	✓
Industrial—Jones Chemical	Hazardous materials present, located in 0.2% annual floodplain		✓		✓	n/a	✓	✓	✓	✓	✓
Industrial—Circuit Technology	Hazardous materials present		✓			n/a	✓	✓	✓	✓	✓
Industrial—Nashua Corporation	Hazardous materials present		✓			n/a	✓	✓	✓	✓	✓

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion*	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Industrial—Anheuser-Busch Brewery and athletic fields	Hazardous materials present, potentially large population present (public events)		✓			n/a	✓	✓	✓	✓	✓
Industrial—BAE Systems	Hazardous materials present		✓			n/a	✓	✓	✓	✓	✓
Industrial—Saint Gobain	Hazardous materials present		✓			n/a	✓	✓	✓	✓	✓
Industrial—Nanocomp	Hazardous materials present		✓			n/a	✓	✓	✓	✓	✓
Recreation—Abbie Griffin Park	Potentially large population present	✓				n/a		✓			
Recreation—Watson Park	Potentially large population present	✓				n/a		✓			
Recreation—Twin Bridges/Kids Cove	Potentially large population present	✓				n/a		✓			
Recreation—Wasserman Park	Potentially large population present	✓				n/a		✓			
Recreation—Kollsman Field	Potentially large population present	✓				n/a		✓			
Recreation—Merrimack Veteran's Memorial Park	Potentially large population present	✓				n/a		✓			
Recreation—Turkey Hill ball fields	Potentially large population present, located in 0.2% annual floodplain	✓			✓	n/a		✓			
Recreation—Camp Sargent	Potentially large population present	✓	✓			n/a	✓	✓	✓	✓	✓
Recreation—YMCA	Potentially large population present		✓			n/a	✓	✓	✓	✓	✓

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion*	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Religious—Grace Baptist Church	Potentially large population present		✓			n/a	✓	✓	✓	✓	✓
Religious—First Congregational Church of Merrimack	Potentially large population present		✓			n/a	✓	✓	✓	✓	✓
Religious—Our Lady of Mercy Church	Potentially large population present		✓			n/a	✓	✓	✓	✓	✓
Religious—Merrimack Valley Baptist Church	Potentially large population present		✓			n/a	✓	✓	✓	✓	✓
Religious—St. James United Methodist Church	Potentially large population present		✓			n/a	✓	✓	✓	✓	✓
Religious—Faith Episcopal Church	Potentially large population present		✓			n/a	✓	✓	✓	✓	✓
Religious—St. John Newman Church	Potentially large population present, located in 1% annual floodplain		✓		✓	n/a	✓	✓	✓	✓	✓
Religious—Riverside Christian Church	Potentially large population present, located in 0.2% annual floodplain		✓		✓	n/a	✓	✓	✓	✓	✓
Religious—Merrimack Baptist Temple	Potentially large population present		✓			n/a	✓	✓	✓	✓	✓
Religious—Kingdom Hall	Potentially large population present, located in 1% annual floodplain		✓		✓	n/a	✓	✓	✓	✓	✓
Residential—Rose Haven	Elderly housing, large population present, contents have personal value to owners		✓			n/a	✓	✓	✓	✓	✓
Residential—Wentworth Place	Elderly housing, large population present, contents have personal value to owners		✓			n/a	✓	✓	✓	✓	✓

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion*	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Residential—Parker Village	Elderly housing, large population present, contents have personal value to owners		✓			n/a	✓	✓	✓	✓	✓

**It is beyond the scope of this project to determine whether each general occupancy facility is located in the fluvial erosion hazard zone. A mapping exercise such as this has been included as a mitigation action in Section 4.2 of this Plan Update.*

Table 6.2—Essential Facilities

Facility Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Police Station Headquarters	Contents and staff valuable to emergency management. Serves as communications/dispatch center, backup Emergency Operations Center.		✓				✓	✓	✓	✓	✓
Central Fire Station No. 1 (Headquarters)	Contents and staff valuable to emergency management. Serves as Emergency Operations Center, backup communication/dispatch center. Located in 0.2% annual floodplain.		✓		✓		✓	✓	✓	✓	✓
Reed's Ferry Fire Station No. 3	Contents and staff valuable to emergency management.		✓				✓	✓	✓	✓	✓
South Merrimack Station No. 2	Contents and staff valuable to emergency management.		✓				✓	✓	✓	✓	✓
Public Works Highway Facility	Contents valuable to transportation network and public infrastructure.		✓				✓	✓	✓	✓	✓

Facility Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Government—Solid Waste Transfer Facility	Potentially large population present, used during cleanup efforts after hazard event		✓				✓	✓	✓	✓	✓
Jones Chemical	Critical to water purification throughout east coast and Cananda, located in 0.2% annual floodplain		✓		✓		✓	✓	✓	✓	✓
Merrimack High School	Potentially large population present.		✓				✓	✓	✓	✓	✓
Merrimack Middle School	Potentially large population present. Shelter for up to 1,000.		✓				✓	✓	✓	✓	✓
Mastricola Upper Elementary School	Potentially large population present.		✓				✓	✓	✓	✓	✓
Mastricola Elementary School	Potentially large population present.		✓				✓	✓	✓	✓	✓
Reeds Ferry Elementary School	Potentially large population present.		✓				✓	✓	✓	✓	✓
Thornton's Ferry Elementary School	Potentially large population present.		✓				✓	✓	✓	✓	✓
Dartmouth Hitchcock Medical Center	Contents valuable to public health, large staff and population present		✓				✓	✓	✓	✓	✓
Home and Health Hospice Care	Contents valuable to public health, large staff and population present		✓				✓	✓	✓	✓	✓
St. Joseph Medical Center	Contents valuable to public health, large staff and population present		✓				✓	✓	✓	✓	✓
Southern NH Health System, Merrimack Medical Center	Contents valuable to public health, large staff and population present		✓				✓	✓	✓	✓	✓

Table 6.3—Transportation Critical Facilities

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion*	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Highway System—Daniel Webster Highway	Structure valuable to motor vehicle travel and safety, evacuation route; portion of DW Highway ovr Baboosic Brook immediately north of Wire Road is located in Very High Fluvial Erosion Hazard Zone.		✓			✓	✓		✓	✓	
Highway System—Wire Road from DW Highway to Bedford Road	Structure valuable to motor vehicle travel and safety, evacuation route; portions of Wire Road between DW Highway and Everett Turnpike border Very High Fluvial Erosion Hazard Zone along Baboosic Brook.		✓			✓	✓		✓	✓	
Highway System—Baboosic Lake Road east and west from DW Highway to Amherst town line	Structure valuable to motor vehicle travel and safety, evacuation route		✓				✓		✓	✓	
Highway System—FE Everett Turnpike north and south from Bedford town line to Nashua city line	Structure valuable to motor vehicle travel and safety, evacuation route; portion of FE Everett Turnpike over Baboosic Brook is located in Very High Fluvial Erosion Hazard Zone.		✓			✓	✓		✓	✓	
Highway System—Amherst Road east and west from Continental Blvd to Amherst town line	Structure valuable to motor vehicle travel and safety, evacuation route		✓				✓		✓	✓	
Highway System—Continental Blvd east and west from DW Highway to Route 101A	Structure valuable to motor vehicle travel and safety, evacuation route		✓				✓		✓	✓	

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion*	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Highway System—bridge over Baboosic Brook at Stowell Road	Structure valuable to motor vehicle travel and safety, located in 1% annual floodplain and 0.2% annual floodplain		✓		✓	n/a	✓		✓	✓	
Highway System—bridge over Baboosic Brook at Wire Road	Structure valuable to motor vehicle travel and safety, located in 1% annual floodplain		✓		✓	n/a	✓		✓	✓	
Highway System—bridge over Souhegan tributary at Amherst Road	Structure valuable to motor vehicle travel and safety		✓			n/a	✓		✓	✓	
Highway System—bridge over Baboosic Brook at Bedford Road	Structure valuable to motor vehicle travel and safety, located in 1% annual floodplain		✓		✓	n/a	✓		✓	✓	
Highway System—bridge over Baboosic Brook at Route 3	Structure valuable to motor vehicle travel and safety, located in 1% annual floodplain		✓		✓	n/a	✓		✓	✓	
Highway System—bridge over Baboosic Brook at Bean Road	Structure valuable to motor vehicle travel and safety, located in 1% annual floodplain		✓		✓	n/a	✓		✓	✓	
Highway System—Access Road near Loop Road Culvert over Baboosic Brook	Structure valuable to motor vehicle travel and safety, received Mostly Compatible rating, located in 1% annual floodplain		✓		✓		✓	✓	✓	✓	
Highway System—Bean Road Culvert over Baboosic Brook	Structure valuable to motor vehicle travel and safety, received Partially Compatible rating, located in 1% annual floodplain		✓		✓	✓	✓	✓	✓	✓	
Highway System—Bedford Road Culvert over Baboosic Brook	Structure valuable to motor vehicle travel and safety, received Mostly Incompatible rating, located in 1% annual floodplain		✓		✓	✓	✓	✓	✓	✓	
Railroad System—railroad bridge at Depot Street	Structure valuable to rail travel and safety, located in 0.2% annual floodplain		✓		✓	n/a	✓		✓	✓	

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion*	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Railroad System—railroad bridge at Griffin Street	Structure valuable to rail travel and safety, located in 1% annual floodplain		✓		✓	n/a	✓		✓	✓	
Railroad System—railroad bridge over Souhegan River at Railroad Ave	Structure valuable to rail travel and safety, located in 1% annual floodplain		✓		✓	n/a	✓		✓	✓	
Railroad System—railroad bridge over Pennichuck Brook at Amherst Road	Structure valuable to rail travel and safety		✓			n/a	✓		✓	✓	
Railroad System—railroad bridge over Horseshoe Pond outlet	Structure valuable to rail travel and safety, located in 1% annual floodplain		✓		✓	n/a	✓		✓	✓	
Railroad System—railroad bridge over Pennichuck Brook	Structure valuable to rail travel and safety, located in 1% annual floodplain		✓		✓	n/a	✓		✓	✓	
Railroad System—railroad crossing at Mast Road	Critical to access wastewater treatment		✓			n/a	✓		✓	✓	
Airport Systems—FAA Center	Structure valuable to air traffic control		✓				✓	✓	✓	✓	✓

**The field assessment protocol used to determine fluvial erosion hazard zones was only able to determine potential structural vulnerability in culverts and cannot be applied to bridges.*

Table 6.4—Utility Systems

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion*	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Communication—Fair Point Communications	Structure valuable to communications		✓			n/a	✓	✓	✓	✓	✓
Communication—Fair Point Communications	Structure valuable to communications		✓			n/a	✓	✓	✓	✓	✓

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion*	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Communications—repeater at Hutchinson Road	Structure valuable to communications		✓			n/a	✓	✓	✓	✓	✓
Communications—voter at MPO	Structure valuable to communications		✓			n/a	✓	✓	✓	✓	✓
Electric—PSNH sub-station at Bedford town line	Structure valuable to utility network		✓			n/a	✓	✓	✓	✓	✓
Electric—PSNH sub-station at Star Drive	Structure valuable to utility network		✓			n/a	✓	✓	✓	✓	✓
Electric—PSNH sub-station at Front Street	Structure valuable to utility network		✓			n/a	✓	✓	✓	✓	✓
Electric—PSNH sub-station at Railroad Ave	Structure valuable to utility network		✓			n/a	✓	✓	✓	✓	✓
Electric—PSNH lines at McGraw and DW Highway	Structure valuable to utility network		✓			n/a	✓	✓	✓	✓	✓
Electric—PSNH lines at 411 DW Highway (Fairpoint Switching Network)	Structure valuable to utility network		✓			n/a	✓	✓	✓	✓	✓
Electric—PSNH lines at 239 DW Highway	Structure valuable to utility network		✓			n/a	✓	✓	✓	✓	✓
Oil/Propane—Bot-L-Gas	Contents valuable to energy supply, propane distributor; 90,000 gallon tank		✓			n/a	✓	✓		✓	
Oil/Propane—Rochette's Oil Service	Contents valuable to energy supply, propane distributor		✓			n/a	✓	✓		✓	
Water—Merrimack Village District office	Water District office		✓			n/a	✓	✓	✓	✓	✓
Water—Hutchinson Road water tower	1,000,000 gallons; structure valuable to water supply	✓	✓			n/a	✓			✓	
Water—Turkey Hill water tower	5,000,000 gallons; structure valuable to water supply	✓	✓			n/a	✓			✓	

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion*	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Water—Parker Drive water tower	600,000 gallons; structure valuable to water supply	✓	✓			n/a	✓			✓	
Water—Merrimack Village District Well #2	Structure valuable to water supply, located in 0.2% annual floodplain	✓			✓	n/a					
Water—Merrimack Village District Well #3	Structure valuable to water supply,	✓				n/a					
Water—Merrimack Village District Well #4	Structure valuable to water supply, located in 0.2% annual floodplain	✓			✓	n/a					
Water—Merrimack Village District Well #5	Structure valuable to water supply, located in 0.2% annual floodplain	✓			✓	n/a					
Water—Merrimack Village District Well #7	Structure valuable to water supply, located in 1% annual floodplain	✓			✓	n/a					
Water—Merrimack Village District Well #8	Structure valuable to water supply, located in 1% annual floodplain	✓			✓	n/a					
Wastewater—Pennichuck Wastewater pumping station at Mast Rd	Structure valuable to sewage pumping, located in 0.2% annual floodplain		✓		✓	n/a	✓	✓			
Wastewater—Thornton's Ferry sewage pumping station at Greely Rd	Structure valuable to sewage pumping, located in 0.2% annual floodplain		✓		✓	n/a	✓	✓			
Wastewater—Souhegan sewage pumping station at Railroad Ave	Structure valuable to sewage pumping, located in 0.2% annual floodplain		✓		✓	n/a	✓	✓			
Wastewater—sewage pump station at Pearson Road	Structure valuable to sewage pumping		✓			n/a	✓	✓			
Wastewater—sewage pump station at Burt Street	Structure valuable to sewage pumping		✓			n/a	✓	✓			
Wastewater—Pennichuck Square sewage pump station	Structure valuable to sewage pumping, located in 1% annual floodplain		✓		✓	n/a	✓	✓			
Wastewater—exposed sewer pipe over Baboosic Brook	Structure valuable to sewage treatment, located in 1% annual floodplain		✓		✓	n/a	✓	✓			

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion*	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Wastewater—exposed sewer pipe over Horseshoe Pond outlet	Structure valuable to sewage treatment		✓			n/a	✓	✓			
Wastewater—Railroad Ave siphon station, inlet	Structure valuable to sewage treatment		✓			n/a	✓	✓			
Wastewater—Railroad Ave siphon station, outlet	Structure valuable to sewage treatment		✓			n/a	✓	✓			
Wastewater—80 Acres siphon station, inlet	Structure valuable to sewage treatment, structure located in 1% annual floodplain		✓		✓	n/a	✓	✓			
Wastewater—80 Acres siphon station, outlet	Structure valuable to sewage treatment, structure located in 0.2% annual floodplain		✓		✓	n/a	✓	✓			
Wastewater—Mallard Point siphon station, inlet	Structure valuable to sewage treatment, structure located in 1% annual floodplain		✓		✓	n/a	✓	✓			
Wastewater—Mallard Point siphon station, outlet	Structure valuable to sewage treatment		✓			n/a	✓	✓			
Wastewater—Conifer Street siphon station, inlet	Structure valuable to sewage treatment		✓			n/a	✓	✓			
Wastewater—Conifer Street siphon station, outlet	Structure valuable to sewage treatment		✓			n/a	✓	✓			

**It is beyond the scope of this project to determine whether utility infrastructure is located in the fluvial erosion hazard zone. A mapping exercise such as this has been included as a mitigation action in Section 4.2 of this Plan Update.*

Table 6.5—High Potential Hazard Facilities

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion*	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Stump Pond Dam Location—42.805 lat, -71.5583 long Hazard Class—L Water body—Farley Brook Owner—Town of Merrimack	Structure valuable to flood control, located in 0.2% annual floodplain		✓		✓	n/a	✓		✓	✓	
Naticook Lake Dam Location—42.8216 lat, -71.5252 long Hazard Class—L Water body—Naticook Brook Owner—Town of Merrimack	Structure valuable to flood control, located in 1% annual floodplain		✓		✓	n/a	✓		✓	✓	
Meadow Wood Pond Dam Location—42.8652 lat, -71.5236 long Hazard Class—L Water body—Souhegan River tributary Owner—Town of Merrimack	Structure valuable to flood control		✓			n/a	✓		✓	✓	
Fish Pond Dam Location—42.8936 lat, -71.47 long Hazard Class—NM Water body—Dumpling Brook Owner—privately held	Structure valuable to flood control		✓			n/a	✓		✓	✓	
Watson Dam Location—42.8452 lat, -71.5316 long Hazard Class—NM Water body—Watson Brook Owner—privately held	Structure valuable to flood control		✓			n/a	✓		✓	✓	

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion*	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Farm Pond Dam Location—42.89327 lat, -71.512853 long Hazard Class—NM Water body—unnamed stream Owner—privately held	Structure valuable to flood control, located in 1% annual floodplain		✓		✓	n/a	✓		✓	✓	
Watson Brook Pond Dam Location—42.8427 lat, -71.533 long Hazard Class—NM Water body—Watson Brook Owner—privately held	Structure valuable to flood control		✓			n/a	✓		✓	✓	
Recreation Pond Dam Location—42.8666 lat, -71.5288 long Hazard Class—NM Water body—runoff Owner—privately held	Structure valuable to flood control		✓			n/a	✓		✓	✓	
Carriage Place Pond Dam Location—42.8172 lat, -71.5569 long Hazard Class—NM Water body—unnamed stream Owner—privately held	Structure valuable to flood control		✓			n/a	✓		✓	✓	
Fire Pond Dam Location—42.85 lat, -71.5077 long Hazard Class—NM Water body—unnamed stream Owner—privately held	Structure valuable to flood control		✓			n/a	✓		✓	✓	
Standard Hardware Dam Location—42.830585 lat, -71.49751 long Hazard Class—NM Water body—runoff Owner—privately held	Structure valuable to flood control		✓			n/a	✓		✓	✓	

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion*	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
C & I Investment Pond Location—42.82894 lat, -71.487679 long Hazard Class—NM Water body—runoff Owner—privately held	Structure valuable to flood control		✓			n/a	✓		✓	✓	
Peaslee Place I Location—42.8261 lat, -71.5502 long Hazard Class—NM Water body—runoff Owner—privately held	Structure valuable to flood control		✓			n/a	✓		✓	✓	
Fidelity Det Basin 3 Location—42.8119 lat, -71.5241 long Hazard Class—NM Water body—runoff Owner—privately held	Structure valuable to flood control		✓			n/a	✓		✓	✓	
Doyle Woods Det Pond Dam Location—42.8319 lat, -71.4972 long Hazard Class—NM Water body—runoff Owner—privately held	Structure valuable to flood control		✓			n/a	✓		✓	✓	
Home Depot Det Pond Dam Location—42.8441 lat, -71.4941 long Hazard Class—NM Water body—runoff Owner—privately held	Structure valuable to flood control		✓			n/a	✓		✓	✓	
Wasserman Detention Pond Location—42.8236 lat, -71.5338 long Hazard Class—NM Water body—none Owner—privately held	Structure valuable to flood control		✓			n/a	✓		✓	✓	

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion*	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Merrimack Outlet Det 3 Location—42.8239 lat, -71.4994 long Hazard Class—NM Water body—runoff Owner—privately held	Structure valuable to flood control		✓			n/a	✓		✓	✓	
Merrimack Outlet Det 4 Location—42.8278 lat, -71.4961 long Hazard Class—NM Water body—runoff Owner—privately held	Structure valuable to flood control		✓			n/a	✓		✓	✓	

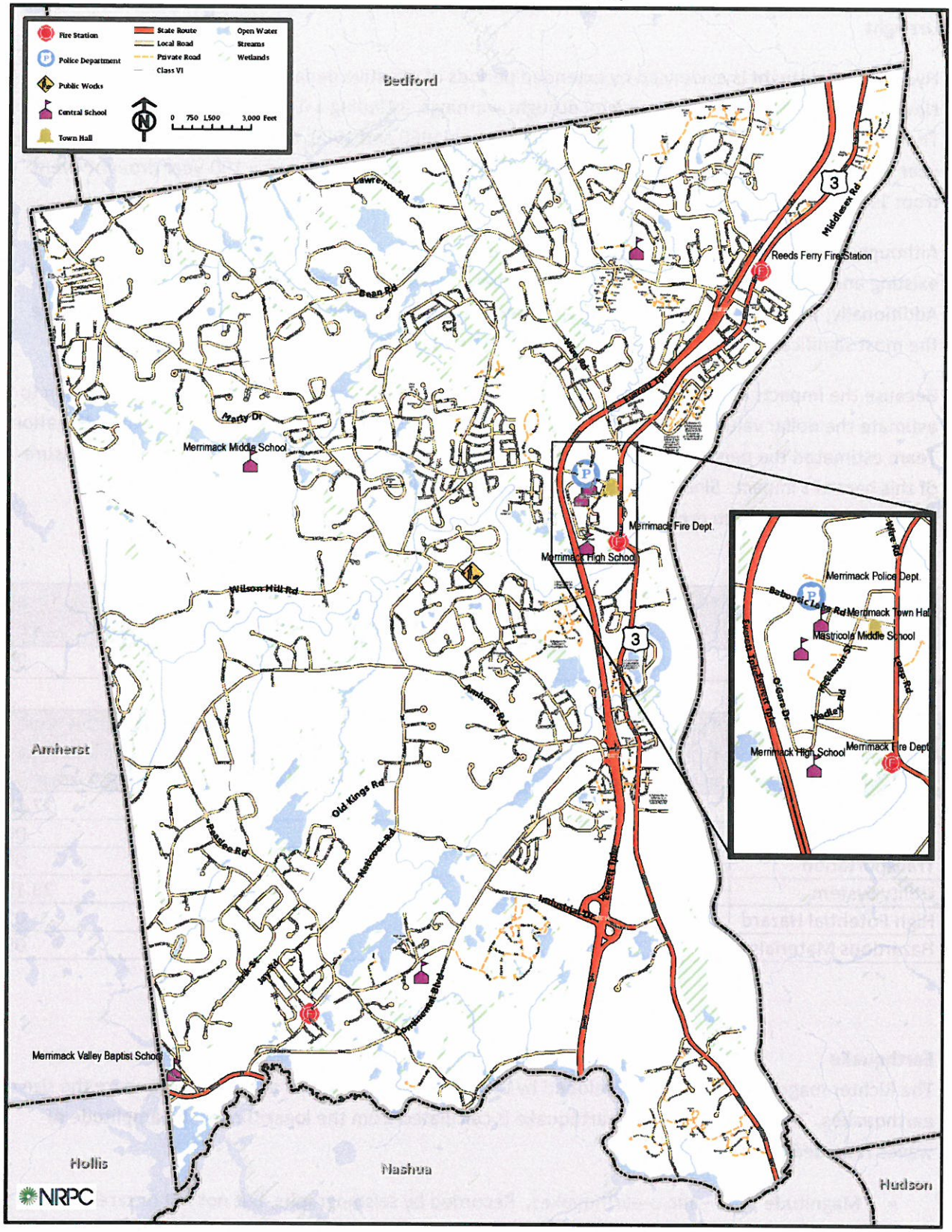
**The field assessment protocol used to determine fluvial erosion hazard zones was only able to determine potential structural vulnerability in culverts and cannot be applied to dams.*

Table 6.6—Hazardous Materials Facilities

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Anheuser-Busch LLC—chemicals on site include polycyclic aromatic compounds and nitric acid.	Chemical and hazardous materials release could have impacts on public health and environmental quality. To date, no chemicals have been released by this facility.		✓				✓	✓	✓	✓	✓
Colt Refining Inc—chemicals on site include copper, lead, mercury, silver compounds, chromium, and nickel.	Chemical and hazardous materials release could have impacts on public health and environmental quality. 2.0 pounds of copper, 0.2 pounds of lead, and 0.1 pounds of mercury have been released into the air from this facility.		✓				✓	✓	✓	✓	✓

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Fluvial Erosion	Hurricane	Severe Thunderstorm	Severe Winter Weather	Tornado/Downburst	Wildfire
Circuit Technology Inc—chemicals on site include lead.	Chemical and hazardous materials release could have impacts on public health and environmental quality. To date, no chemicals have been released by this facility.		✓				✓	✓	✓	✓	✓
Nashua Corp—chemicals on site include toluene, styrene, butyl acetate, vinyl acetate, benzo (G,H,I) perylene, zinc compounds, and polycyclic aromatic compounds.	Chemical and hazardous materials release could have impacts on public health and environmental quality. 17,885 pounds of toluene; 1,921 pounds of styrene; 427 pounds of butyl acrylate; and 137 pounds of vinyl have been released into the air from this facility.		✓				✓	✓	✓	✓	✓
JCI Jones Chemicals Inc—chemicals on site include chlorine, sodium hydroxide (in rail cars).	Chemical and hazardous materials release could have impacts on public health and environmental quality. To date, no chemicals have been released by this facility. Located in 0.2% annual floodplain.		✓		✓		✓	✓	✓	✓	✓
Industrial—Saint Gobain	Hazardous materials present		✓				✓	✓	✓	✓	✓
Industrial—Nanocomp	Hazardous materials present		✓				✓	✓	✓	✓	✓

Merrimack Critical Facilities Map



Section 3.5 ~ Vulnerability by Hazard

Drought

Hydrological drought is evidenced by extended periods of negative departures from normal rainfall. New Hampshire has been under several drought warnings, including a drought emergency, since 1999. The most severe drought conditions occurred between 1960 and 1969; the event had a greater than 25 year recurrence interval. The southern New Hampshire region experienced a 100-year drought event from 1964 to 1965.

Although drought is not likely to damage structures, low water levels can have a negative impact on existing and future home sites, especially those that depend on groundwater for water needs. Additionally, the dry conditions of a drought may lead to an increase wild fire risk. Drought can cause the most significant impact to agricultural land and assets.

Because the impacts of drought are long lasting and wide ranging, it is beyond the scope of this Plan to estimate the dollar value of losses to Merrimack resulting from drought. Instead, the Hazard Mitigation Team estimated the percentage of land in Merrimack vulnerable to drought as a quantitative measure of this hazard's impact. Since there is no significant agricultural land in Merrimack, no lands are particularly vulnerable to drought.

Total Acres of Land in Merrimack	Total Acres of Agricultural Land in Merrimack	% of Land in Merrimack Vulnerable to Drought
20,800	0	0%

Critical Facility Type	Total Number of this type of Critical Facilities in Merrimack	Number of this type of Critical Facilities in Drought Hazard Area	Percentage of this type of Critical Facilities in Drought Hazard Area
General Occupancy	45	8	17.8%
Essential Facilities	17	0	0%
Transportation	23	0	0%
Utility System	39	9	23.1%
High Potential Hazard	19	0	0%
Hazardous Materials	7	0	0%

Earthquake

The Richter magnitude scale was developed by Charles F. Richter in 1935 as a way to compare the size of earthquakes. The magnitude of an earthquake is calculated from the logarithm of the amplitude of waves recorded by seismographs.

- Magnitude <2.0—micro-earthquakes. Recorded by seismographs, but not felt or rarely felt by people. Several million occur annually worldwide on average.

- Magnitude 2.0-2.9—felt slightly by some people. No damage to buildings. Over 1 million occur annually worldwide on average.
- Magnitude 3.0-3.9—often felt by people but very rarely cause damage. Shaking of indoor objects can be noticeable. Over 100,000 occur annually worldwide on average.
- Magnitude 4.0-4.9—noticeable shaking of indoor objects and rattling noises. Felt by most people in affected area. Generally causes minimal to no damage. Moderate to significant damage is very unlikely. 10,000-15,000 occur annually worldwide on average.
- Magnitude 5.0-5.9—felt by everyone. Can cause damage of varying severity to poorly constructed buildings; slight to no damage to all other buildings. Few, if any, casualties. 1,000-1,500 occur annually worldwide on average.
- Magnitude 6.0-6.9—felt up to hundreds of miles from epicenter. Strong to violent shaking in epicenter. Damage to many buildings in populated areas. Poorly designed structures have moderate to severe damage. Earthquake-resistant structures have slight to moderate damage. Damage can be caused far from epicenter. Death toll up to 25,000. 100-150 occur annually worldwide on average.
- Magnitude 7.0-7.9—felt in very large area. Damage to most buildings, including partial or complete collapse. Death toll up to 250,000. 10-20 occur annually worldwide on average.
- Magnitude 8.0-8.9—felt in extremely large region. Major damage to buildings over large areas. Structures likely destroyed. Moderate to heavy damage to sturdy or earthquake-resistant buildings. Death toll up to 1 million. 1 occurs annually worldwide on average.
- Magnitude 9.0< —damage and shaking extends to distant locations. Near or total destruction. Severe damage and collapse to all buildings. Permanent changes in ground topography. 1 occurs every 10-50 years worldwide on average.

Since 1940, there have been 14 earthquakes centered in NH with a magnitude of 3.0 or greater and only two earthquakes with a magnitude of 5.0 or greater. There have been no recorded earthquakes to-date centered in Merrimack, however, one could occur.

Earthquake Hazard Loss Estimate

Step 1. Determine potential earthquake strength in Merrimack

- US Seismic Hazard, 2% in 50 years PGA is 0.12 to 0.14(g) in Merrimack
- *Source: USGS NH Seismic Map*

Step 2. Determine percent building damage ratio to single family residence from PGA (g) 0.15 earthquake

- Wood Frame Construction with Low general seismic design level = 1.3% building damage
- *Source: FEMA Identifying Hazards and Estimating Losses, pg 4-17*

Step 3. Determine percent of structures in Merrimack that would be damaged by PGA (g) 0.15 earthquake

- 5% of structures estimated to be damaged by earthquake
- *Source: Merrimack Hazard Mitigation Team (no historical data on earthquake damage in Merrimack)*

Step 4. Determine total assessed value of structures in Merrimack

- Total Assessed Value of all Structures in Merrimack = $3,186,206,500
- *Source: Merrimack Assessing Department (2014)*

Step 5. Determine total loss from PGA (g) 0.15 Earthquake

- Total Loss from Earthquake = Total Assessed Value of all Structures *Percentage of Structures Estimated to be Damaged * Percent Building Damage Ratio
- Total Loss from Earthquake = $3,186,206,500 * .05 * .013 = **$2,071,034.23**

Critical Facility Type	Total Number of this type of Critical Facilities in Merrimack	Number of this type of Critical Facilities in Earthquake Hazard Area	Percentage of this type of Critical Facilities in Earthquake Hazard Area
General Occupancy	45	38	84.4%
Essential Facilities	17	17	100%
Transportation	23	23	100%
Utility System	39	33	84.6%
High Potential Hazard	19	19	100%
Hazardous Materials	7	7	100%

Extreme Temperatures

Extreme temperatures can be broken into both extreme heat and extreme cold. Though the hazards are different, the effects would be similar to vulnerable populations in Merrimack.

Extreme heat is defined as a period of three consecutive days during which the air temperature reaches 90 degrees Fahrenheit or higher on each day. Extreme heat should not be confused with a drought (extended periods of negative departures from normal rainfall). Overburdened power networks may experience failures due to the impacts of extreme heat.

Extreme cold has no formal definition in New Hampshire, though can be explained as the extended exposure to typical winter temperatures without heat and shelter. With the rising costs of heating fuel and electric heat, many low-income or homeless citizens are not able to adequately heat their homes, exposing themselves to cold related emergencies or death. Extremely cold winters can lead to shortages in heating fuels due to high demand.

Though the entire Merrimack population may experience a thermal emergency, populations without adequate climate control are most at risk. Extreme temperatures are not likely to cause damage to structures, although pipes can burst in extreme cold conditions.

Flooding

Localized Flooding

Localized flooding can result from even minor storms. Runoff overloads the drainage ways and flows into the streets and low-lying areas. Homes and businesses can be inundated, especially basements and

the lower part of first floors. Localized flooding poses most of the same problems caused by larger floods, but because it typically has an impact on fewer people and affects small areas, it tends to bring less State or Federal involvement such as funding, technical help, or disaster assistance. As a result, the community and the affected residents or business owners are left to cope with the problems on their own. Finally, flooding of this type tends to recur; small impacts accumulated over time can become major problems.

Riverine Flooding

Riverine flooding involves the overflowing of normal flood channels, rivers or streams, generally as a result of prolonged rainfall or rapid thawing of snow cover. The lateral spread of floodwater is largely a function of the terrain, becoming greater in wide, flat areas, and affecting narrower areas in steep terrain. In the latter cases, riparian hillsides in combination with steep declines in riverbed elevation often force waters downstream rapidly, sometimes resulting in flash floods.

Floodplains in Merrimack are widest and most extensive adjacent to the Souhegan River and Beaver Brook. Narrower floodplains lie adjacent to Witches Spring Brook, the unnamed stream south of Baboosic Lake, Baboosic Lake, Pulpit Brook, and Joe English Brook extending northeast to Damon Pond and southwest to Lincoln Pond. Many of these floodplains encompass large wetlands areas. Floodplains cover approximately 15% of Merrimack; 11.4% of the Town is within the 1% Annual Floodplain and 3.6% of the Town is within the 0.2% Annual Floodplain.

Dam Failure

The NH Department of Environmental Services indicates several failure modes for dams. Most typical include hydraulic failure or the uncontrolled overflowing of water, seepage, or leaking at the dam's foundation or gate; structural failure or rupture; general deterioration; and gate inoperability. These modes vary between dams depending on their construction type.

The State of New Hampshire uses a hazard potential classification to define the extent of a dam breach or failure. All class S (Significant) and H (High hazard) dams have the potential to cause damage if they breach or fail.

Class H—high hazard: dam that has a high hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in probably loss of human life as a result of: water levels and velocities causing the structural failure of a foundation of a habitable residential structure or commercial or industrial structure that is occupied under normal conditions; water levels rising above 1st floor elevation of a habitable residential structure or a commercial or industrial structure that is occupied under normal conditions when the rise due to dam failure is greater than 1 foot; structural damage to an interstate highway, which could render the roadway impassible or otherwise interrupt public safety services; release of a quantity and concentration of material that qualify as "hazardous waste" under RSA 147-A:2 VII; any other circumstance that would more likely than not cause one or more deaths.

Class S—significant hazard: dam has a significant hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in any of the following: no probably loss of lives; major economic loss to structures or property; structural damage to a Class I or Class II road that would render the road impassable or otherwise interrupt public safety services; major environmental or public health losses.

Class L—low hazard: dam has a low hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in any of the following: no possible loss of life; low economic loss to structures or property; structural damage to a town or city road or private road accessing property other than the dam owner's that could render the road impassible or otherwise interrupt public safety service; the release of liquid industrial, agricultural, or commercial wastes, septage, or contaminated sediment if the storage capacity is less than 2 acre-feet and is located more than 250 feet from a water body or water course; reversible environmental losses to environmentally-sensitive sites.

Class NM—non-menace: dam that is not a menace because it is in a location and of a size that failure or misoperation of the dam would not result in probable loss of life or loss to property, provided the dam is less than 6 feet in height it if has a storage capacity greater than 50 acre-feet; or less than 25 feet in height if it has a storage capacity of 15-50 acre-feet.

Merrimack has 16 Class NM dams (Non-Menace), 3 Class L dams (Low hazard potential), 0 Class S dams (Significant hazard potential), and 0 Class H dams (High hazard potential). Merrimack could also be impacted by dam breaches in Milford, NH. There have been no known dam breaches to-date in Merrimack.

Flood Hazard Loss Estimate

Step 1. Determine percent building damage to a 1 or 2 story building with basement

- 1 foot flood depth = 15% building damage
- 2 foot flood depth = 20% building damage
- 3 foot flood depth = 23% building damage
- 4 foot flood depth = 28% building damage
- *Source: FEMA Identifying Hazards and Estimating Losses, pg 4-13*

Step 2. Determine number of buildings in Merrimack located in the floodplain

- 370 buildings located in floodplain
- *Source: Merrimack Assessing Department*

Step 3. Determine total value of buildings in Merrimack located in floodplain

- Average assessed value of all structures in Merrimack = $319,868.14
- Total number of buildings in Merrimack located in floodplain = 370
- Total assessed value of all buildings in Merrimack in floodplain = $319,868.14 * 370
- Total assessed value of all buildings in Merrimack in floodplain = $118,351,211.80
- *Source: Merrimack Hazard Mitigation Team calculations based on Merrimack Assessing data*

Step 4. Determine total loss from flooding

- Total Loss from Flooding = Total Assessed Value of all Buildings in Floodplain * Percent Building Damage Ratio
- Total Loss from 1 foot flood depth = $118,351,211.80 * .15 = **$17,752,681.77**
- Total Loss from 2 foot flood depth = $118,351,211.80 * .20 = **$23,670,242.36**
- Total Loss from 3 foot flood depth = $118,351,211.80 * .23 = **$27,220,778.71**
- Total Loss from 4 foot flood depth = $118,351,211.80 * .28 = **$33,138,339.30**

Critical Facility Type	Total Number of this type of Critical Facilities in Merrimack	Number of this type of Critical Facilities in 1% Annual Floodplain	Percentage of this type of Critical Facilities in 1% Annual Floodplain	Number of this type of Critical Facilities in 0.2% Annual Floodplain	Percentage of this type of Critical Facilities in 0.2% Annual Floodplain
General Occupancy	45	4	8.9%	4	8.9%
Essential Facilities	17	0	0%	2	11.8%
Transportation	23	12	52.2%	1	4.3%
Utility System	39	6	15.4%	7	17.9%
High Potential Hazard	19	2	10.5%	1	5.3%
Hazardous Materials	7	0	0%	1	14.3%

Fluvial Erosion

Fluvial (river-related) erosion is the wearing away of river beds and banks by the action of running water. Fluvial erosion is a natural process and is most active during flood events. It can result in significant changes to the physical location and dimensions of river and stream channels.

New Hampshire has more than 16,000 miles of rivers and streams. Communities have historically developed along these waterways, placing infrastructure and property in hazard prone areas. Riverine flooding is the most common disaster event in NH. In recent years, some areas of the State have experienced multiple disastrous flood events at recurrence intervals of less than 10 years. On October 3, 2008 Hillsborough and Merrimack Counties experienced severe storms and flooding that led to a Presidential Disaster Declaration and $1,050,147 in damages.

Transportation infrastructure and agricultural property are typically the most vulnerable to fluvial erosion hazards. Fluvial erosion events frequently cause culverts failures, undermine bridges and roads, and wash away stream banks. Residential, commercial, and municipal properties as well as utility infrastructure can also be impacted.

The New Hampshire Department of Environmental Services (DES) and New Hampshire Geological Survey (NHGS) conducted an assessment to identify areas prone to river and stream erosion that could impact public health and safety. The assessment was conducted over the summer and fall of 2013 in the Souhegan and Piscataquog River watersheds. A private firm that specializes in the science of fluvial geomorphology, Field Geology Services, was contracted to conduct the field work. They assessed river and stream reaches using field surveys, topographical maps, aerial photos, and historic archives. Within the Souhegan Watershed, assessments were conducted on segments of the Souhegan River main stem, Baboosic Brook, Beaver Brook, Blood Brook, Great Brook, Hartshorn Brook, Stoney Brook, and Tucker Brook. Only a small section of the Piscataquog River Watershed falls within the Nashua Region and the only reach that was assessed in this area was the South Branch Piscataquog River in Lyndeborough.

Fluvial Erosion Hazard Zone maps provide an important tool for planners, emergency management personnel, and municipal officials. They can be used to identify opportunities for bridge and culvert upgrades, stream and floodplain restoration projects, and areas where development may want to be avoided. The Nashua Regional Planning Commission has incorporated the Fluvial Erosion Hazard data generated by this study into the Town's 2015 Hazard Mitigation Plan Update. Specific mitigation actions that can address public safety and fluvial erosion hazards include:

Map & Assess Vulnerability to Erosion

- Conduct stream assessments and prepare fluvial erosion hazard zone maps
- Develop and maintain a database to track community vulnerability to erosion
- Use GIS to identify concentrations of at-risk structures and infrastructure

Structure and Infrastructure Projects

- Ensure adequate stormwater drainage
- Reduce encroachment of roads, bridges, and culverts into stream channels and flood prone areas
- Ensure culverts and bridges are adequately sized and properly aligned and graded
- Consider relocating at-risk buildings and infrastructure

Help Citizens and Emergency Management Officials become More Aware of Erosion Risks

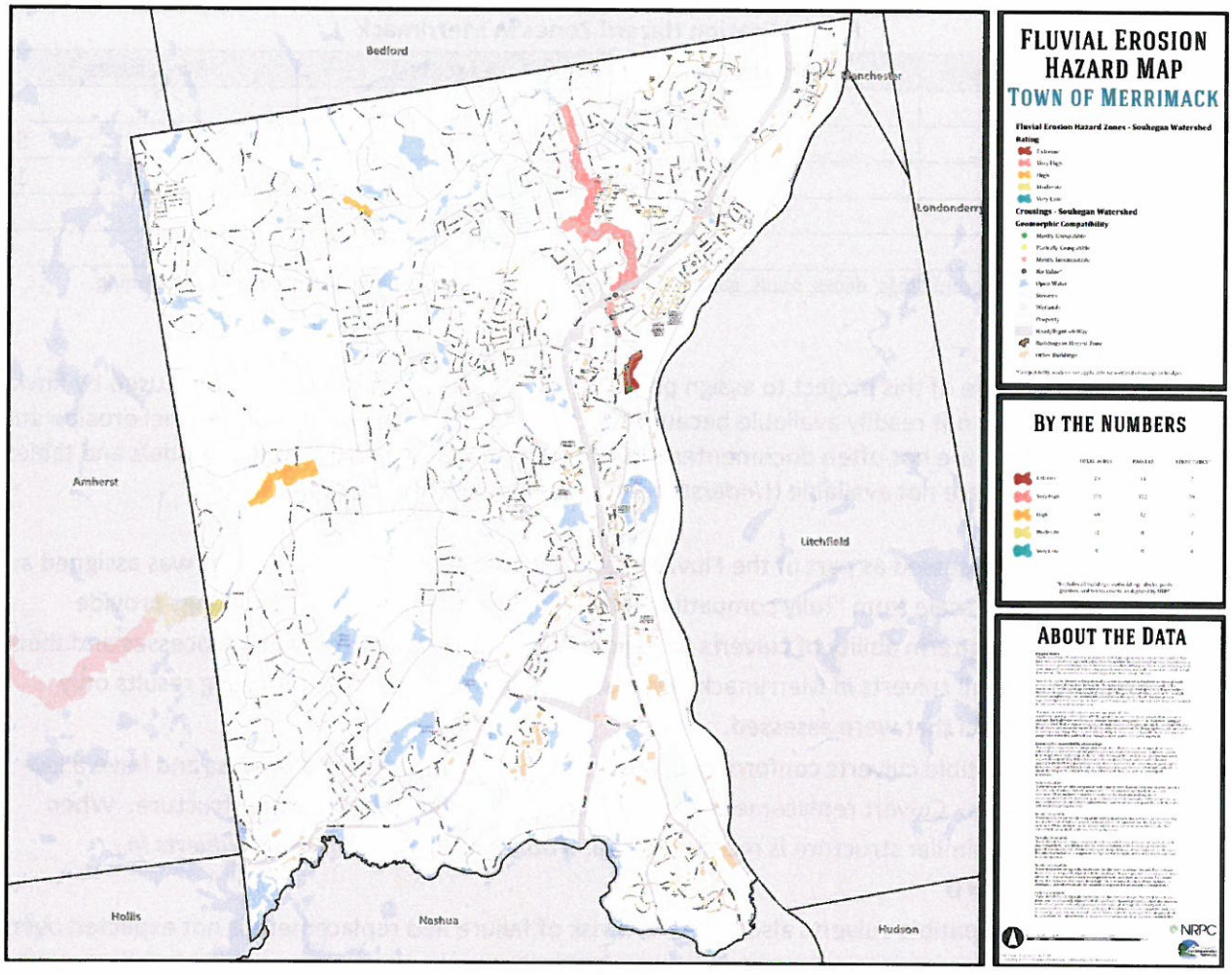
- Notify property owners in high-risk areas
- Develop outreach materials describing erosion risks and potential mitigation techniques
- Offer GIS erosion hazard mapping online

Consider Fluvial Erosion Hazard Areas in Land Use Policy

- Adopt sediment and erosion control regulations
- Consider establishing fluvial erosion hazard overlay districts
- Develop and implement an erosion management plan
- Locate utilities and critical facilities outside of areas susceptible to erosion

- Provide rivers and streams the area they need to maintain or re-establish their natural equilibrium in order to minimize erosion hazards, protect public safety and welfare, and decrease property damage and loss.

Map 2—Fluvial Erosion Hazard Zones in Merrimack



Fluvial Erosion Hazard (FEH) zones attempt to identify lands most vulnerable to fluvial erosion. Each river reach assessed through this project was assigned a sensitivity rating as a measure of extent. Sensitivity can be defined as the potential of a river to respond to flood events, through bank erosion and lateral migration (across the floodplain) processes. Rivers, as a result of the combination of their geologic context and extent of historical development, will vary in their likelihood to experience flood-event driven rapid changes. Past activities, such as for example channel straightening, can increase the potential for change in a flood. Reaches already experiencing erosion are prone to such rapid changes, given the exposed bank materials available for the power of water to erode into. The occurrences of such features are incorporated into the sensitivity rankings, where generally, the greater number of features present that can cause changes, the higher the sensitivity to change.

Broadly, assignment of an "Extreme" category means a reach that is experiencing considerable erosion of its beds and banks, and typically has flood chutes and meander cutoffs that maximize the potential

for changing flow paths and further erosion during a large flood. Conversely, a rating of "Very Low" is typically found in a bedrock gorge, where the flow path will not change on time scales of concern to people.

Fluvial Erosion Hazard Zones in Merrimack

Sensitivity Rating	Total Acres	Parcels	Structures*
Extreme	23	13	7
Very High	173	112	59
High	69	32	14
Moderate	11	8	2
Very Low	0	0	0

*Includes all buildings, outbuildings, decks, pools, gazebos, and tennis courts as digitized by Nashua Regional Planning Commission

It is beyond the scope of this project to assign potential damage estimates to structures caused by fluvial erosion. This data is not readily available because specific flood damages caused by channel erosion and migration processes are not often documented. In addition, standard loss estimation models and tables for erosion damage are not available (*Understanding Your Risks*, FEMA, pg 4-30).

Culverts were also assessed as part of the Fluvial Erosion Hazard study and each culvert was assigned a score ranking it on a scale from "fully compatible" to "fully incompatible." These rankings provide guidance on the long-term ability of culverts to handle flow and sediment transport processes and their risk of failure. Not all culverts in Merrimack were assessed in this study. The following results only include those culverts that were assessed.

- Fully Compatible culverts conform with natural river channel form and process and have a low risk of failure. Culvert replacement is not expected over the lifetime of the structure. When replaced, a similar structure is recommended. ***Total # of Fully Compatible culverts in Merrimack* = 0**
- Mostly Compatible culverts also have a low risk of failure and replacement is not expected over the lifetime of the structure. When replaced, minor design adjustments are recommended to achieve full compatibility. ***Total # of Mostly Compatible culverts in Merrimack* = 1**
- Partially Compatible culverts are either compatible with current form or process, but not both. There is a moderate risk of culvert failure and replacement may be needed during the design lifetime. When replaced, a redesign of the culvert installation is recommended. ***Total # of Partially Compatible culverts in Merrimack* = 1**
- Mostly Incompatible culverts are typically undersized for their channel and/or are poorly aligned with the upstream channel geometry. These culverts have a moderate to high risk of structural failure and should be redesigned when replaced to improve compatibility. ***Total # of Mostly Incompatible culverts in Merrimack* = 1**
- Fully Incompatible culverts are typically undersized for their channel and/or are poorly aligned with the upstream channel geometry. They also have reduced passage of sediment through the culvert and an increased risk of erosion. These culverts have a high risk of failure and should be

prioritized for replacement with more compatible structures. ***Total # of Fully Incompatible culverts in Merrimack* = 0**

A complete table of all the culverts assessed in Merrimack, including location information and compatibility ratings, appears in the Appendix to this Plan.

Hurricane/Tropical Storm

The Atlantic hurricane season lasts from June 1 through November 30 and peaks in late August and September. The Saffir-Simpson Hurricane Wind Scale categorizes hurricanes from 1 to 5 based on sustained wind speed. The National Weather Service National Hurricane Center provides the following estimates of potential property damage based on hurricane wind speed (http://www.nhc.noaa.gov/aboutsshws.php).

Category 1—sustained winds 74-95 mph. Very dangerous winds will produce some damage. Well-constructed frame homes could have damage to roof, shingles, vinyl siding, and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.

Category 2—sustained winds 96-110 mph. Extremely dangerous winds will cause extensive damage. Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.

Category 3—sustained winds 111-129 mph. Devastating damage will occur. Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.

Category 4—sustained winds 130-156 mph. Catastrophic damage will occur. Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Category 5—sustained winds 157 mph or higher. Catastrophic damage will occur. A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possible months. Most of the area will be uninhabitable for weeks or months.

FEMA declared disasters in Hillsborough County during Hurricane Bob (1991) and Hurricane Floyd (1999). Though these were the only formally declared incidents, Merrimack has experienced strong

remnants of numerous tropical cyclones including Hurricane Carol (1954), Donna (1960), Gloria (1985), Irene (2011), and Sandy (2012).

Hurricane Hazard Loss Estimate

There are no standard loss estimation models or tables for wind damage (*Understanding Your Risks,* FEMA, pg 4-30). As such, the Hazard Mitigation Team used data from previous hurricane events to determine damage estimates. Historically, the strongest hurricane seen in NH was a Category 3, so loss estimates were calculated based on a hurricane of that strength. Hurricanes have primarily damaged road networks and infrastructure in NH. It is beyond the scope of this project to estimate the costs of repairing or replacing transportation and utility infrastructure damaged by a hurricane. The Hazard Mitigation Team used the following calculations to estimate loss to single family residential structures from a hurricane.

Step 1. Determine percent building damage ratio to single family residence from Category 3 hurricane

- Wood Frame Construction, Low general hurricane design level = 20% building damage
- *Source: Merrimack Hazard Mitigation Team*

Step 2. Determine percent of structures in Merrimack that would be damaged by Category 3 hurricane

- 5% of structures estimated to be damaged by Category 3 hurricane
- *Source: Merrimack Hazard Mitigation Team (no historical data on hurricane damage in Merrimack)*

Step 3. Determine total assessed value of structures in Merrimack

- Total Assessed Value of all Structures in Merrimack = $3,186,206,500
- *Source: Merrimack Assessing Department (2014)*

Step 4. Determine total loss from Category 3 hurricane

- Total Loss from Hurricane = Total Assessed Value of all Structures *Percentage of Structures Estimated to be Damaged * Percent Building Damage Ratio
- Total Loss from Hurricane = $3,186,206,500 * .05 * .2 = **$31,862,065**

Critical Facility Type	Total Number of this type of Critical Facilities in Merrimack	Number of this type of Critical Facilities in Hurricane Hazard Area	Percentage of this type of Critical Facilities in Hurricane Hazard Area
General Occupancy	45	38	84.4%
Essential Facilities	17	17	100%
Transportation	23	23	100%
Utility System	39	33	84.6%
High Potential Hazard	19	19	100%
Hazardous Materials	7	7	100%

Severe Thunderstorm

Severe thunderstorms typically contain heavy rainfall, high winds, and lightning. In extreme cases, thunderstorms have the potential to create tornadoes and downbursts. While thunderstorms are a common occurrence during the summer, not all thunderstorms create damage or injure humans.

Severe thunderstorms can create heavy rainfall, which may result in localized flooding. While thunderstorm tracking has become more accurate, severe thunderstorms typically result in very little warning and the aftermath of their rain and wind is extremely difficult to estimate.

By definition, all thunderstorms contain lightning. Lightning is a giant spark of electricity that occurs within the atmosphere or between the atmosphere and the ground. As lightning passes through the air, it heats the air to a temperature of about 50,000 degrees Fahrenheit, considerably hotter than the surface of the Sun. During a lightning discharge, the sudden heating of the air causes it to expand rapidly. After the discharge, the air contracts quickly as it cools back to ambient temperatures. This rapid expansion and contraction causes a shock wave that we hear as thunder.

Lightning is a major hazard to citizens involved in outdoor activities. A lightning strike at a densely attended special event has the potential to create a major mass casualty incident. Lightning also can create wildfires and structure fires and may cause power and/or communications outages.

Severe Thunderstorm Hazard Loss Estimate

Losses from severe thunderstorms would be similar to those sustained by hurricanes, only on a smaller, more localized scale. The Hazard Mitigation Team used the following calculations to estimate loss to single family residential structures from a severe thunderstorm.

Step 1. Determine percent building damage ratio to single family residence from severe thunderstorm

- Wood Frame Construction, Low general hurricane design level = 5% building damage
- *Source: Merrimack Hazard Mitigation Team*

Step 2. Determine percent of structures in Merrimack that would be damaged by severe thunderstorm

- 0.5% of structures estimated to be damaged by severe thunderstorm
- *Source: Merrimack Hazard Mitigation Team (no historical data on severe thunderstorm damage in Merrimack)*

Step 3. Determine total assessed value of structures in Merrimack

- Total Assessed Value of all Structures in Merrimack = $3,186,206,500
- *Source: Merrimack Assessing Department (2014)*

Step 4. Determine total loss from severe thunderstorm

- Total Loss from Severe Thunderstorm = Total Assessed Value of all Structures *Percentage of Structures Estimated to be Damaged * Percent Building Damage Ratio
- Total Loss from Severe Thunderstorm = $3,186,206,500 * .005 * .05 = **$796,551.63**

Critical Facility Type	Total Number of this type of Critical Facilities in Merrimack	Number of this type of Critical Facilities in Severe Thunderstorm Hazard Area	Percentage of this type of Critical Facilities in Severe Thunderstorm Hazard Area
General Occupancy	45	45	100%
Essential Facilities	17	17	100%
Transportation	23	4	17.4%
Utility System	39	30	76.9%
High Potential Hazard	19	0	0%
Hazardous Materials	7	7	100%

Severe Winter Weather

A heavy snowstorm is generally considered to be one that deposits two or more inches of snow per hour in a twelve-hour period. Heavy snow can immobilize a region, stranding commuters, closing businesses, and disrupting emergency services. Accumulating snow can collapse buildings and knock down trees and power lines. Snow removal from roadways, utility damage, and disruption to businesses can have a significant economic impact on municipalities and residents.

A blizzard is a violent snowstorm with winds blowing at a minimum speed of 35 miles per hour and visibility of less than one-quarter mile for three hours. A Nor'easter is a large weather system traveling from south to north, passing along the coast. As the storm's intensity increases, the resulting counterclockwise winds impact the coast and inland areas in a Northeasterly direction. Winds from a Nor'easter can meet or exceed hurricane force, knocking down trees, utility poles, and power lines.

Ice storms occur when a mass of warm, moist air collides with a mass of cold, arctic air. The less dense warm air rises and the moisture precipitates out in the form of rain. When this rain falls through the colder, more-dense air and comes in contact with cold surfaces, ice forms and can become several inches thick. Heavy accumulations of ice can knock down trees, power lines, and communications for extended periods of time. Ice Storm extent can be defined by the Sperry-Piltz Ice Accumulation Index:

- 0—minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages
- 1—some isolated or localized utility interruptions are possible, typically lasing on a few hours. Roads and bridges may become slick and hazardous.
- 2—scattered utility interruptions expected, typically lasing 12-24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
- 3—numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasing 1-5 days.
- 4—prolonged and widespread utility interruptions with extensive damage to main distribution feeder lines and some high voltage transmission lines/structures. Outages lasing 5-10 days.
- 5—catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed

In recent years, FEMA issued disaster declarations in Hillsborough County for severe winter weather in 1998, 2008, 2010, 2011, and 2013. Among these storms was a rare Nor'easter in late October of 2011 that caused major destruction in Hillsborough and Rockingham Counties. Heavy wet snow fell on trees that had much of their foliage remaining. Many trees could not withstand the extra weight of the snow and collapsed under the stress. Damage was very focused in the southern part of New Hampshire and caused nearly three times the amount of debris that the 2008 ice storm produced.

Severe Winter Weather Hazard Loss Estimate

Severe Winter Weather events have primarily damaged road networks and infrastructure in NH. It is beyond the scope of this project to estimate the costs of repairing or replacing transportation and utility infrastructure damaged by severe winter weather. The Hazard Mitigation Team used the following calculations to estimate loss to single family residential structures from severe winter weather.

Step 1. Determine percent building damage ratio to single family residence from severe winter weather

- Wood Frame Construction, no additional provisions for roof snow loads = 5% building damage
- *Source: Merrimack Hazard Mitigation Team*

Step 2. Determine percent of structures in Merrimack that would be damaged by severe winter weather

- 1% of structures estimated to be damaged by severe winter weather
- *Source: Merrimack Hazard Mitigation Team*

Step 3. Determine total assessed value of structures in Merrimack

- Total Assessed Value of all Structures in Merrimack = $3,186,206,500
- *Source: Merrimack Assessing Department (2014)*

Step 4. Determine total loss from Severe Winter Weather

- Total Loss from Severe Winter Weather = Total Assessed Value of all Structures *Percentage of Structures Estimated to be Damaged * Percent Building Damage Ratio
- Total Loss from Severe Winter Weather = $3,186,206,500 * .01 * .05 = **$1,593,103.25**

Critical Facility Type	Total Number of this type of Critical Facilities in Merrimack	Number of this type of Critical Facilities in Severe Winter Weather Hazard Area	Percentage of this type of Critical Facilities in Severe Winter Weather Hazard Area
General Occupancy	45	38	84.4%
Essential Facilities	17	17	100%
Transportation	23	23	100%
Utility System	39	12	30.8%
High Potential Hazard	19	19	100%
Hazardous Materials	7	7	100%

Tornado/Downburst

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of 1 mile wide and 50 miles long. Tornadoes are created when cold air overrides warm air, causing the warm air to rise rapidly.

A downburst is a severe localized wind blasting down from a thunderstorm. These 'straight line' winds are distinguishable from tornadic activity by their pattern of destruction and debris. Depending on the size and location of these events, the destruction to property may be devastating. Downbursts fall into two categories. Microbursts cover an area less than 2.5 miles in diameter and macrobursts cover an area at least 2.5 miles in diameter.

Hillsborough County has a higher risk of tornado activity compared to the rest of the State. Between 1961 and 1998 there were 15 known tornadoes in Hillsborough County. The most recent downburst activity occurred on July 6, 1999 in the form of a macroburst in Merrimack, Grafton and Hillsborough Counties. There were two fatalities as well as roof damage, widespread power outages, and downed trees, utility poles and wires.

Tornado Hazard Loss Estimate

There are no standard loss estimation models or tables for tornados (*Understanding Your Risks,* FEMA, pg 4-27). As such, the Hazard Mitigation Team used data from previous tornado events to determine damage estimates. Historically, the strongest tornado seen in Hillsborough County was a F2, so loss estimates were calculated based on a tornado of that strength.

Step 1. Determine percent building damage ratio to single family residence from F2 tornado

- Wood Frame Construction, Low general tornado design level = 50% building damage
- *Source: Merrimack Hazard Mitigation Team*

Step 2. Determine percent of structures in Merrimack that would be damaged by F2 tornado

- 1% of structures estimated to be damaged by F2 tornado
- *Source: Merrimack Hazard Mitigation Team (no historical data on tornado damage in Merrimack)*

Step 3. Determine total assessed value of structures in Merrimack

- Total Assessed Value of all Structures in Merrimack = $3,186,206,500
- *Source: Merrimack Assessing Department (2014)*

Step 4. Determine total loss from F2 Tornado

- Total Loss from Tornado = Total Assessed Value of all Structures *Percentage of Structures Estimated to be Damaged * Percent Building Damage Ratio
- Total Loss from Tornado = $3,186,206,500 * .01 * .5 = **$15,931,032.50**

Critical Facility Type	Total Number of this type of Critical Facilities in Merrimack	Number of this type of Critical Facilities in Tornado Hazard Area	Percentage of this type of Critical Facilities in Tornado Hazard Area

General Occupancy	45	38	84.4%
Essential Facilities	17	17	100%
Transportation	23	23	100%
Utility System	39	17	43.6%
High Potential Hazard	19	19	100%
Hazardous Materials	7	7	100%

Wildfire

Wildfires are fires ignited in grassy or wooded areas. They may be ignited intentionally by humans, naturally through lightning, or accidentally due to spark ignition from sources such as power lines or fireworks. The interface between forested lands and developed lands poses an ongoing threat to property from wildfires. Potential wildfire areas outside of the recommended response time radius from the fire station may pose a higher risk to structures and residents than those located closer to the fire station.

Wildfire hazard losses are dependent on a number of factors, including access to parcels, lot size, proximity to forested lands, topography, building materials, and proximity to fire protection water source.

Wildfire Hazard Loss Estimate

Step 1. Determine percent building damage ratio to single family residence from wildfire

- Wood Frame Construction, combustible siding and decking = 20% building damage
- *Source: Merrimack Hazard Mitigation Team*

Step 2. Determine percent of structures in Merrimack that would be damaged by wildfire

- 0.5% of structures estimated to be damaged by wildfire
- *Source: Merrimack Hazard Mitigation Team*

Step 3. Determine total assessed value of structures in Merrimack

- Total Assessed Value of all Structures in Merrimack = $3,186,206,500
- *Source: Merrimack Assessing Department (2014)*

Step 4. Determine total loss from Wildfire

- Total Loss from Wildfire = Total Assessed Value of all Structures *Percentage of Structures Estimated to be Damaged * Percent Building Damage Ratio
- Total Loss from Wildfire = $3,186,206,500 * .005 * .2 = **$3,186,206.50**

Critical Facility Type	Total Number of this type of Critical Facilities in Merrimack	Number of this type of Critical Facilities in Wildfire Hazard Area	Percentage of this type of Critical Facilities in Wildfire Hazard Area
General Occupancy	45	38	84.4%
Essential Facilities	17	17	100%

Transportation	23	1	4.3%
Utility System	39	12	30.8%
High Potential Hazard	19	0	0%
Hazardous Materials	7	7	100%

Section 3.6 ~ Overall Summary of Vulnerability

Table 7a—Overall Summary of Vulnerability by Hazard

Hazard	Types of Critical Facilities Impacted by Hazard	Impact of Hazard	% of Critical Facilities in Hazard Area	% of Structures Estimated to be Damaged	$ Value of Loss
Drought	Agricultural land. Not likely to have a significant impact on structures.	Loss of crops. Inadequate quantity of drinking water. Loss of water for fire protection. Increased risk of fire.	General Occupancy = 17.8% Essential Facilities = 0% Transportation = 0% Utility Systems = 23.1% High Potential Hazard = 0% Hazardous Materials = 0%	0 acres of agricultural land	Calculating $ value of losses is beyond the scope of this Plan (see Section 3.5 Drought for explanation)
Earthquake	General Occupancy Essential Facilities Transportation Utility Systems High Potential Hazard Hazardous Materials	Structural damage or collapse of buildings. Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, municipal communications, radio system. Loss of water for fire protection.	General Occupancy = 84.4% Essential Facilities = 100% Transportation = 100% Utility Systems = 84.6% High Potential Hazard = 100%	5%	$2,071,034.23

Hazard	Types of Critical Facilities Impacted by Hazard	Impact of Hazard	% of Critical Facilities in Hazard Area	% of Structures Estimated to be Damaged	$ Value of Loss
		Risk to life, medical surge.	Hazardous Materials = 100%		
Extreme Temperatures	Not likely to have a significant impact on structures.	Overburdened power networks. Heating fuel shortages. Risk to life from prolonged exposure.	General Occupancy = 0% Essential Facilities = 0% Transportation = 0% Utility Systems = 0% High Potential Hazard = 0% Hazardous Materials = 0%	0%	$0
Flooding	General Occupancy Transportation High Potential Hazard Hazardous Materials	Water damage to structures and their contents. Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, municipal communications, radio system. Environmental hazards resulting from damage. Isolation of neighborhoods resulting from flooding.	General Occupancy = 8.9% in 1% annual floodplain; 8.9% in 0.2% annual floodplain Essential Facilities = 0% in 1% annual floodplain; 11.8% in 0.2% annual floodplain Transportation = 52.2% in 1% annual floodplain; 4.3% in 0.2% annual floodplain Utility Systems	Up to 370 buildings	1 foot flood = $17,752,681.77 2 foot flood = $23,670,242.36 3 foot flood = $27,220,778.71 4 foot flood = $33,138,339.30

Hazard	Types of Critical Facilities Impacted by Hazard	Impact of Hazard	% of Critical Facilities in Hazard Area	% of Structures Estimated to be Damaged	$ Value of Loss
			= 15.4% in 1% annual floodplain; 17.9% in 0.2% annual floodplain High Potential Hazard = 10.5% in 1% annual floodplain; 5.3% in 0.2% annual floodplain Hazardous Materials = 0% in 1% annual floodplain; 14.3% in 0.2% annual floodplain		
Fluvial Erosion	• General Occupancy • Transportation Systems	Washed out culverts. Undermined bridges and roadways. Property loss and damage to structures located along washed out stream banks.	General Occupancy = n/a Essential Facilities = 0% Transportation = 21.7% Utility Systems = n/a High Potential Hazard = n/a Hazardous Materials = 0%	Up to 82 structures	It is beyond the scope of this project to assign potential damage estimates to structures caused by fluvial erosion.
Hurricane/Tropical Storm	General Occupancy Essential Facilities Transportation	Wind damage to structures and trees. Water damage	General Occupancy = 84.4% Essential	5%	$31,862,065

Hazard	Types of Critical Facilities Impacted by Hazard	Impact of Hazard	% of Critical Facilities in Hazard Area	% of Structures Estimated to be Damaged	$ Value of Loss
	Utility Systems High Potential Hazard Hazardous Materials	to structures and their contents. Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, municipal communications, radio system. Environmental hazards resulting from damage. Isolation of neighborhoods resulting from flooding.	Facilities = 100% Transportation = 100% Utility Systems = 84.6% High Potential Hazard = 100% Hazardous Materials = 100%		
Severe Thunderstorm	General Occupancy Essential Facilities Utility System High Potential Hazard Hazardous Materials	Smoke and fire damage to structures. Disruption to power lines and municipal communications. Damage to critical electronic equipment. Injury or death to people involved in outdoor activity.	General Occupancy = 100% Essential Facilities = 100% Transportation = 17.4% Utility Systems = 76.9% High Potential Hazard = 0% Hazardous Materials = 100%	0.5%	$796,551.63
Severe Winter Weather	General Occupancy Essential Facilities Transportation	Disruption to road network. Damage to trees and power lines, communications.	General Occupancy = 84.4% Essential Facilities =	1%	$1,593,103.25

Hazard	Types of Critical Facilities Impacted by Hazard	Impact of Hazard	% of Critical Facilities in Hazard Area	% of Structures Estimated to be Damaged	$ Value of Loss
	Utility High Potential Hazard Hazardous Materials	Structural damage to roofs/collapse. Increase in CO, other hazards.	100% Transportation = 100% Utility Systems = 30.8% High Potential Hazard = 100% Hazardous Materials = 100%		
Tornado/Downburst	General Occupancy Essential Facilities Transportation Utility System High Potential Hazard Hazardous Materials	Wind damage to structures and trees. Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, municipal communications, radio system. Environmental hazards resulting from damage. Medical surge.	General Occupancy = 84.4% Essential Facilities = 100% Transportation = 100% Utility Systems = 43.6% High Potential Hazard = 100% Hazardous Materials = 100%	1%	$15,931,032.50
Wildfire	General Occupancy Essential Facilities Utility System High Potential Hazard Hazardous Materials	Smoke and fire damage to structures in wild land/urban interface. Damage to habitat. Impacts to air quality. Loss of natural	General Occupancy = 84.4% Essential Facilities = 100% Transportation = 4.3% Utility Systems = 30.8%	0.5%	$3,186,206.50

Hazard	Types of Critical Facilities Impacted by Hazard	Impact of Hazard	% of Critical Facilities in Hazard Area	% of Structures Estimated to be Damaged	$ Value of Loss
		resources.	High Potential Hazard = 0% Hazardous Materials = 100%		

Table 7b—Overall Summary of Vulnerability by Facility Type

Facility Type	Total # of facilities	# susceptible to Drought	# susceptible to Earthquake	# susceptible to Extreme Temperatures	# susceptible to Flooding	# susceptible to Fluvial Erosion	# susceptible to Hurricane	# susceptible to Severe Thunderstorm	# susceptible to Severe Winter Weather	# susceptible to Tornado/Downburst	# susceptible to Wildfire
General Occupancy	45	8	38	0	4 in 1% annual, 4 in 0.2% annual	n/a	38	45	38	38	38
Essential Facilities	17	0	17	0	0 in 1% annual; 2 in 0.2% annual	0	17	17	17	17	17
Transportation	23	0	23	0	12 in 1% annual; 1 in 0.2% annual	5	23	4	23	23	1
Utility	39	9	33	0	6 in 1% annual; 7 in 0.2% annual	n/a	33	30	12	17	12
High Hazard	19	0	19	0	2 in 1% annual; 1 in 0.2% annual	n/a	19	0	19	19	0
Hazardous Materials	7	0	7	0	0 in 1% annual; 1 in 0.2% annual	0	7	7	7	7	7

Section 3.7 ~ National Flood Insurance Program

The Town of Merrimack participates in the National Flood Insurance Program (NFIP). This provides full insurance coverage based on risk as shown on detailed Flood Insurance Rate Maps (FIRMs). Merrimack joined the NFIP on July 16, 1979. The Town's initial Flood Hazard Boundary Map was identified on April 12, 1974 and its initial Flood Insurance Rate Map was identified on July 16, 1979. The current effective map date is September 25, 2009.

Merrimack has 95 NFIP policies in force and $22,316,200 of insurance in force. There have been 51 paid losses totaling $1,205,852. Merrimack has 8 repetitive loss properties with repetitive loss payments totaling $818,835. All repetitive loss structures in Merrimack have been single family residential.

As a participant in the NFIP, communities must agree to adopt a floodplain management ordinance and enforce the regulations found in the ordinance. Merrimack has adopted the "Flood Hazard Conservation District," found in Section 2.02.8 of the Merrimack Zoning Ordinance and Building Code. The Flood Hazard Conservation District is determined to be the flood hazard areas designated by the Federal Insurance Administration, through on-site mapping of elevations in the flood hazard areas of the Town of Merrimack, dated September 25, 2008. The Flood Hazard Conservation District is shown in the Flood Insurance Study and on the Flood Insurance Rate Maps of Hillsborough County, NH. In all cases where the Flood Hazard Conservation District is super-imposed over another zoning district in the Town, the district whose regulations are the more restrictive shall apply.

The purpose of the Flood Hazard Conservation District is:

- To prevent unwise use of lands susceptible to flooding within Special Flood Hazard Areas; to promote sound orderly development of the Town's resources; and to reduce future flood damage, financial loss, suffering, and loss of life.
- To prevent the development of residential, commercial, and industrial buildings and other land uses in Special Flood Hazard Areas, which would impede the natural water flow or result in an increase in flood levels during flood periods.
- To prevent the destruction and inappropriate use of flood-prone land.
- To prevent unnecessary or excessive expenses on the part of the Town to provide and maintain essential services and utilities which arise because of inharmonious use of lands within Special Flood Hazard Area.
- To prevent culverting, damming, dredging or obstructing such as to impede or obstruct natural water flow during its maximum flood level.
- To prevent the building of public facilities such as schools, hospitals, fire, police departments, or other similarly related agencies except those necessary for the public health, safety, and welfare, whereupon such uses shall otherwise remain in full conformance with applicable Federal requirements.

To demonstrate the Merrimack's continued compliance with NFIP requirements, the Hazard Mitigation Team identified the follow mitigation actions as part of its comprehensive mitigation strategy. These actions also appear in Section 4.2, Table 9—Mitigation Actions.

Table 8—National Flood Insurance Program Mitigation Actions

National Flood Insurance Program Mitigation Actions			
Mitigation Action	**Mitigation Type**	**Hazard Addressed**	**Critical Facilities Addressed**
Establish mutual aid agreements with neighboring communities to address administering the NFIP following a major storm event. Form partnerships between local, state, and regional entities to expand resources and improve coordination to support floodplain management.	• Emergency Services Protection	• Flooding • Erosion • Hurricane	• General Occupancy • Essential Facilities • Transportation Systems • Utility Systems • High Potential Hazard • Hazardous Materials
Incorporate flood mitigation into local planning. Revise/adopt subdivision regulations and erosion control regulations to improve floodplain management in Merrimack.	• Prevention • Natural Resources Protection	• Flooding • Erosion • Hurricane	• General Occupancy • Essential Facilities • Transportation Systems • Utility Systems • High Potential Hazard • Hazardous Materials
Prepare, distribute, or make available NFIP, insurance, and building codes explanatory pamphlets or booklets.	• Public Information	• Flooding	• General Occupancy

CHAPTER 4. MITIGATION STRATEGY

Section 4.1 ~ Goals and Objectives to Reduce Vulnerabilities to Hazards

The first step in developing a mitigation strategy is to establish goals that reflect what the municipality wishes to achieve through the implementation of its Hazard Mitigation Plan. The Merrimack Hazard Mitigation Team established the following goals and objectives, based on its desire to protect the Town's population, critical facilities, infrastructure, emergency services, natural resources, and private property. These goals provided the basis for identifying and prioritizing mitigation actions.

Goal 1—Prevent the impacts of natural hazards on the Town's population, critical facilities, infrastructure, emergency services, natural resources, and private property whenever possible.

- Objective 1.1—Manage development of known hazard areas to avoid the risks associated with natural hazards.
- Objective 1.2—Plan to incorporate hazard mitigation into capital improvements and other future initiatives.
- Objective 1.3—Ensure building codes and other standards include requirements that make new construction more disaster resistant.
- Objective 1.4—Support the maintenance of this hazard mitigation plan.

Goal 2—Protect the Town's existing critical facilities, infrastructure, and private property from the impacts of natural hazards through cost effective mitigation activities.

- Objective2.1—Modify existing structures to reduce damage from future natural hazard events.
- Objective 2.2—Perform cost effective flood hazard mitigation measures to protect private property.

Goal 3—Educate and inform the Town's residents to help them become more resilient to natural hazards impacting the community.

- Objective 3.1—Utilize educational methods to change the perception from "disaster losses are acceptable" to "many disaster losses are preventable if mitigation practices are followed."
- Objective 3.2—provide educational opportunities across all age ranges.
- Objective 3.3—Develop and distribute public awareness materials regarding the relative risk of natural hazards and practical mitigation measures to reduce damages and injuries.

Goal 4—Address the challenges of natural resource degradation and the associated increased risk from hazards.

- Objective 4.1—Ensure development in hazard areas does not destroy natural barriers to damage, such as floodplains and vegetation.
- Objective 4.2—Protect or recreate environmental assets to help safeguard the built environment.

Goal 5—Protect emergency services, critical facilities, and other critical capabilities from hazard damage in order for them to remain operational.

- Objective 5.1—Identify critical facilities, infrastructure, and emergency services and their vulnerabilities to natural hazards.
- Objective 5.2— Develop and implement programs to promote hazard mitigation actions that protect the provision of emergency services in Town.

- Objective 5.3—Identify, maintain, and protect evacuation routes from hazard damage so they are usable when needed.

Section 4.2 ~ Mitigation Actions

After establishing goals and objectives to reduce vulnerabilities to each hazard type, the Hazard Mitigation Team identified mitigation actions to achieve these goals. The resulting mitigation actions appear in Table 9 below.

Table 9—Mitigation Actions

Mitigation Action	Mitigation Type	Hazard Addressed	Critical Facilities Addressed
National Flood Insurance Program Mitigation Actions			
Establish mutual aid agreements with neighboring communities to address administering the NFIP following a major storm event. Form partnerships between local, state, and regional entities to expand resources and improve coordination to support floodplain management.	• Emergency Services Protection	Flooding Erosion Hurricane	• General Occupancy • Essential Facilities • Transportation Systems • Utility Systems • High Potential Hazard • Hazardous Materials
Incorporate flood mitigation into local planning. Revise/adopt subdivision regulations and erosion control regulations to improve floodplain management in Merrimack.	• Prevention • Natural Resources Protection	Flooding Erosion Hurricane	• General Occupancy • Essential Facilities • Transportation Systems • Utility Systems • High Potential Hazard • Hazardous Materials
Prepare, distribute, or make available NFIP, insurance, and building codes explanatory pamphlets or booklets.	• Public Information	• Flooding	• General Occupancy
Additional Mitigation Actions			
Require water conservation by enforcing the year	• Prevention • Public Education • Natural Resources	• Drought	• General Occupancy • Utility System

Mitigation Action	Mitigation Type	Hazard Addressed	Critical Facilities Addressed
round even/odd water ordinance, which limits the days outside watering is allowed based on street address and date.	Protection		
Map and assess vulnerability to erosion. Conduct stream assessments and prepare fluvial erosion hazard zone maps.	• Prevention	• Fluvial Erosion	• General Occupancy • Essential Facilities • Transportation Systems • Utility Systems • High Potential Hazard • Hazardous Materials
Remove structures from flood-prone areas to minimize future flood losses.	• Prevention	• Flooding	• General Occupancy • Essential Facilities • Utility Systems • Hazardous Materials
Implement culvert and bridge capacity improvements at hazard prone locations identified in DPW Plan and Fluvial Erosion Study	• Structural	• Flooding • Fluvial Erosion • Hurricane	• Transportation Systems
Elevate new roads and bridges above the base flood elevation and raise existing low-lying bridges and roads.	• Structural	• Flooding • Fluvial Erosion • Hurricane	• Transportation Systems
Protect critical communications and equipment from lightning damage by installing surge protection on critical electronic equipment and backup servers and using battery backups.	• Property Protection	• Severe Thunderstorm	• General Occupancy • Essential Facilities • Utility Systems • Hazardous Materials
Protect vulnerable populations from the impacts of extreme temperatures and	• Prevention • Public Education	• Extreme Temperatures • Severe Winter Weather	• Vulnerable populations

Mitigation Action	Mitigation Type	Hazard Addressed	Critical Facilities Addressed
severe winter storms by establishing heating and cooling centers at designated facilities and providing transportation to and from these centers.			
Enforce the International Building Code (IBC) and International Residential Code (IRC) to protect buildings and infrastructure from the impacts of earthquakes, flooding, hurricanes, and winter storms.	• Prevention • Property Protection	• Earthquake • Flooding • Hurricanes • Severe Winter Weather	• General Occupancy • Essential Facilities • Transportation Systems • Utility Systems • High Potential Hazard • Hazardous Materials
Conduct outreach and education programs to increase awareness of earthquakes, extreme temperatures (including carbon monoxide risks), hurricanes, severe thunderstorms, and severe winter weather.	• Public Education	• Severe Thunderstorm • Severe Winter Weather • Tornado • Wildfire	• General Occupancy • Essential Facilities • Transportation Systems • Utility Systems • High Potential Hazard • Hazardous Materials
Remove fuel from urban/wild land interface.	• Prevention • Property protection • Natural resource protection	• Wildfire	• General Occupancy • Essential Facilities • Transportation Systems • Utility Systems • High Potential Hazard • Hazardous Materials
Implement structural inspections of roofs and deploy trained maintenance personnel for roof snow-removal operations at critical facilities.	• Property Protection	• Severe Winter Weather	• Essential Facilities
Protect power lines by working with utility companies to harden	• Prevention	• Hurricane • Tornado • Severe Winter	• Transportation Systems • Utility Systems

Mitigation Action	Mitigation Type	Hazard Addressed	Critical Facilities Addressed
electrical infrastructure, including trimming trees near power lines. Consider the costs and benefits of requiring that overhead power lines be buried in all new developments.		Weather	

Section 4.3 ~ Prioritizing Mitigation Actions

After identifying mitigation actions to address each hazard, the Team then began a two-step process to prioritize them. The first step was to conduct a benefit cost review. Benefit cost reviews provide a comprehensive overview of the monetary and non-monetary costs and benefits associated with each action. During this process, the Hazard Mitigation Team asked a variety of questions such as, "How beneficial is this action to the entire Town?" "How many people will benefit from this action?" "How large of an area is impacted by this project?" "How costly is this project?"

Table 10—Benefit Cost Review

Mitigation Action	Likely Benefits	Likely Costs
Establish mutual aid agreements with neighboring communities to address administering the NFIP following a major storm event. Form partnerships between local, state, and regional entities to expand resources and improve coordination to support floodplain management.	• This action helps municipalities to share resources and decreases the burden on any one community. • This action helps the Town to know what resources are available for use in an emergency. • This action has the potential to reduce flood related economic losses.	• Responding to a mutual aid call in a neighboring community could take away resources from Merrimack. • Mutual aid calls for non-federally declared disasters would not be reimbursed by FEMA. • Percentage of $9,380 *(source: 2013-2014 Fire Department Emergency Management budget)*
Incorporate flood mitigation into local planning. Revise/adopt subdivision regulations and erosion control regulations to improve floodplain management in Merrimack.	• This action would be most beneficial to residents in flood-prone areas of Town. • This action has the potential to reduce flood related economic losses.	• There are potential economic costs associated with limiting where development can go. • Percentage of $66,604 *(source: 2013-2014 Budget, Planning/Zoning Administrator Wages line item)*
Prepare, distribute, or make	• Educate residents,	• Minimal, part of normal

Mitigation Action	Likely Benefits	Likely Costs
available NFIP, insurance, and building codes explanatory pamphlets or booklets.	builders, and other professionals about NFIP • Reduce property loss costs associated with flooding	town operations • $200 *(source: 2013-2014 Code Enforcement Clerical wages)*
Require water conservation by enforcing the year round even/odd water ordinance, which limits the days outside watering is allowed based on street address and date.	• If followed, it would help to reduce the impacts of drought.	• The effectiveness of this action depends on the ability of the Town to enforce it. • This action is costly to enforce • $4,400 Advertising & Public Information; $500 Public Education *(source: 2012-2013 Merrimack Village District budget)*
Map and assess vulnerability to erosion. Conduct stream assessments and prepare fluvial erosion hazard zone maps.	• This action is the first step towards avoiding and reducing future losses from erosion. • This action can help determine how areas at greatest risk of erosion can be targeted for hazard mitigation opportunities.	• $0—the entire cost of this action is being borne by the NH DES through a FEMA Pre-Disaster Mitigation grant. There are no costs to the Town.
Remove structures from flood-prone areas to minimize future flood losses.	• This action would avoid future flood losses to the properties that are moved. • Decrease in emergency response costs.	• Loss of tax revenue from the property. • FEMA covers the administrative costs associated with this action. • $0—no direct costs to Town, town only facilitates process
Implement culvert and bridge capacity improvements at hazard prone locations identified in DPW Plan and Fluvial Erosion Study	• Taking this action helps reduce the risk of major repair costs that might occur if no action were taken. • There are environmental benefits to local waterways and aquatic organisms. • Although individual culvert and storm drain repairs only occur in a localized area, they may be	• It is expensive to replace culverts. • Individual culvert and storm drain repairs may only benefit a localized area, while the economic costs are shared among the entire population. • $5,000-$105,000 per culvert; $800,000 per bridge *(source: Merrimack CIP)*

Mitigation Action	Likely Benefits	Likely Costs
	beneficial to a large portion of the population depending on how heavily traveled and densely developed the area is.	
Elevate new roads and bridges above the base flood elevation and raise existing low-lying bridges and roads.	• Taking this action helps reduce the risk of major repair costs that might occur if no action were taken. • Solves the problem of bridge and roadway flooding and ensures safe, reliable transportation.	• Very costly action to implement • $30,000 design; $170,000 construction *(Source: 2013-2020 CIP, Capital Reserve Fund)*
Protect critical communications and equipment from lightning damage by installing surge protection on critical electronic equipment and backup servers and using battery backups.	• Reduced inconvenience and loss associated with a shutdown of critical facilities due to lightning damage	• $200 per department *(source: 2013-2014 Maintenance—Office Equipment budget)*
Protect vulnerable populations from the impacts of extreme temperatures and severe winter storms by establishing heating and cooling centers at designated facilities and providing transportation to and from these centers.	• This action would benefit the entire Town and particularly the most at risk and needy populations. • This action has broad social benefits for the community.	• This action could be costly if it was used outside of a federally declared disaster. • Percentage of $165,079 *(source: 2013-2014 Welfare budget)*
Enforce the International Building Code (IBC) and International Residential Code (IRC) to protect buildings and infrastructure from the impacts of earthquakes, flooding, hurricanes, and winter storms.	• This action would be effective at avoiding and reducing future losses. • This action is beneficial to all applicable buildings across the entire Town.	• This action may not benefit older structures not subject to newer building codes. • Percentage of $57,712 *(source: 2013-2014 Building Inspector budget)*
Conduct outreach and education programs to increase awareness of earthquakes, extreme temperatures (including carbon monoxide risks), hurricanes, severe thunderstorms, and severe winter weather.	• The Town currently has the capacity to implement this action. • This action is beneficial to all residents in Town.	• This action may have limited impact because it can be difficult to get people to pay attention to outreach campaigns. • Percentage of $38,275 *(source: 2013-2014 Fire Department Education and Training budget)*
Remove fuel from urban/wild land interface.	• This action would be most beneficial to portions of Town near wooded areas.	• Large scale wildfires are relatively rare in Merrimack and therefore

Mitigation Action	Likely Benefits	Likely Costs
	• Sound logging practices can help reduce the risk of wildfire.	the costs of implementing this action may outweigh the benefits of reduced property damage. • Opinions vary about wildfire management, so this action could cause social and political tension. • $5,000-$50,000 depending on scope and location *(source: Merrimack Fire Department Budget)*
Implement structural inspections of roofs and deploy trained maintenance personnel for roof snow-removal operations at critical facilities.	• Protects critical municipal buildings and avoids future losses • Reduces liability to Town	• Adds additional burden to Fire Department during time when they may need to be responding to increased level of emergency calls • $2,500 per building *(source: Buildings and Grounds Maintenance budget for department)*
Protect power lines by working with utility companies to harden electrical infrastructure, including trimming trees near power lines. Consider the costs and benefits of requiring that overhead power lines be buried in all new developments.	• Reduced inconvenience and loss associated with a shutdown of critical facilities. • Decreased burden on vulnerable populations.	• Tree removal may be incompatible with local aesthetics • Burying power lines may be cost prohibitive • Buried power lines would only benefit those living in areas with underground utilities. • $1,200 per large tree for removal *(source: Merrimack Highway Dept. Tree Service budget)* • $5,000 for preliminary cost benefit review of power line burial *(source: 2013-2014 Budget, Planning/Zoning Administrator Wages line item)*

After completing a Benefit Cost review for each action, the Hazard Mitigation Team then prioritized the actions by conducting a STAPLEE Analysis, which stands for Social, Technical, Administrative, Political,

Legal, Economic, and Environmental factors. For each mitigation action, the Team asked the following questions:

- Social— Will the action unfairly affect any one segment of the population? Will it disrupt established neighborhoods? Is it compatible with present and future community values? Will it adversely affect cultural resources?
- Technical—How effective is the action in avoiding or reducing future losses? Will it create more problems than it solves? What are some secondary impacts? Does it solve a problem or only a symptom?
- Administrative— Does the community have the capability to implement the action? Can the community provide the necessary maintenance? Can it be accomplished in a timely manner?
- Political— Is there public support both to implement and maintain the action? Is the political leadership willing to support it? Does it present a financial burden to stakeholders?
- Legal— Does the community have the authority to implement the action? Is enabling legislation necessary? What are the legal side effects? Will the community be liable for the actions, support of actions, or lack of actions?
- Economic— What are the costs of this action? How will the costs be borne? Are state/federal grant programs applicable? Does the action fit into existing capital improvements or economic development budgets?
- Environmental— How will this action affect the environment? Does it comply with local, state, and federal environmental regulations? Is it consistent with community environmental goals? Are endangered or threatened species likely to be affected?

The cost and benefit of each mitigation action were then evaluated and assigned a quantitative score based on the STAPLEE criteria.

Benefit Score Range: 0 = Not Beneficial, 1 = Somewhat Beneficial, 2 = Beneficial, 3 = Very Beneficial

Cost Score Range: 0 = Not Costly, -1 = Somewhat Costly, -2 = Costly, -3 = Very Costly

Next, the scores for each action were added to determine priority. Finally, the Hazard Mitigation Team reviewed the scores and resulting prioritization to make sure it was consistent with the Town's goals and Master Plan. Actions that received the same STAPLEE score will be further prioritized by the Hazard Mitigation Team based on implementation costs. The STAPLEE analysis and prioritized mitigation actions appear in Table 11 below.

Table 11—STAPLEE Analysis

Mitigation Action: Implement structural inspections of roofs and deploy trained maintenance personnel for roof snow-removal operations at critical facilities.			
Criteria	**Evaluation**	**Cost**	**Benefit**
Social	This action will not unfairly affect any segment of the population, disrupt established neighborhoods, or adversely affect cultural resources. It is compatible with community values, as it will protect critical municipal buildings.	0	2

Technical	This action is effective at reducing and avoiding future losses to critical municipal facilities. It will not create more problems than it solves.	0	3
Administrative	Merrimack has the capacity to implement this action. The Fire Department would be the responsible party to implement the action. It can be accomplished in a timely manner, although it may occur during periods of high demand for emergency response calls.	-1	2
Political	There is public support to implement and maintain this action. The political leadership is also willing to support it.	0	2
Legal	The community has the authority to implement the action and no enabling legislation is necessary. The community would be liable for a lack of action that resulted in the collapse of a roof on a municipal building.	0	3
Economic	The cost for this action would be covered by existing building and grounds maintenance budgets. If no action was taken and the roof collapsed on any of these buildings, the economic losses would be significant.	-1	2
Environmental	This action will not impact the environment.	0	0
Subtotal		**2**	**14**
Total		**12**	
Priority		**1**	

Mitigation Action: Map and assess vulnerability to erosion. Conduct stream assessments and prepare fluvial erosion hazard zone maps.			
Criteria	**Evaluation**	**Cost**	**Benefit**
Social	This action will not unfairly affect any segment of the population, disrupt established neighborhoods, or adversely affect cultural resources. It is compatible with the community's values of protecting life and property.	0	1
Technical	This action is the first step towards avoiding and reducing future losses from erosion. Mapping and assessment will help to determine how areas at greatest risk of erosion can be targeted for hazard mitigation opportunities.	0	1
Administrative	NH Department of Environmental Services (NH DES) is the responsible party to implement this action. NH DES is currently conducting fluvial erosion hazard assessments in the Souhegan and Piscataquog River watersheds. This action can be accomplished in a timely manner. Field assessments and analysis will be complete by September 2014.	0	2
Political	There is public support to implement and maintain this action. The political leadership is also willing to support it.	0	1
Legal	NH DES and the Town of Merrimack have the authority to implement the action and no enabling legislation is necessary.	0	1
Economic	The entire cost of this action is being borne by NH DES through a FEMA Pre-Disaster Mitigation grant. There are no costs to the Town of Merrimack.	0	3

Environmental	This action has the potential to reduce property damage and subsequent environmental impacts.	0	2
Subtotal		**0**	**11**
Total		**11**	
Priority		**2**	

Mitigation Action: Protect power lines by working with utility companies to harden electrical infrastructure, including trimming trees near power lines. Consider the costs and benefits of requiring that overhead power lines be buried in all new developments.			
Criteria	**Evaluation**	**Cost**	**Benefit**
Social	This action will not unfairly affect any segment of the population, disrupt established neighborhoods, or adversely affect cultural resources.	0	2
Technical	This action is effective in avoiding or reducing future losses. It will not create more problems than it solves. It solves the problem rather than only a symptom. It will reduce the inconvenience from a shutdown of critical facilities resulting from power outages.	0	3
Administrative	Merrimack has the capacity to implement this action. The Highway Department would be the responsible party to implement the tree trimming portion of this action. Community Development is responsible for considering the costs/benefits of burying power lines.	-1	2
Political	There is public support to implement and maintain this action. Developers may not support this action if it significantly increases their costs.	-1	2
Legal	Merrimack has the authority to implement this action. All applicable local and state laws will be followed.	0	2
Economic	Tree trimming costs may partially be borne by utility companies. The costs of not taking action could be significant	-1	2
Environmental	This action will not impact the environment.	0	0
Subtotal		**-3**	**13**
Total		**10**	
Priority		**3**	

Mitigation Action: Conduct outreach and education programs to increase awareness of earthquakes, extreme temperatures (including carbon monoxide risks), hurricanes, wildfire, severe thunderstorms, and severe winter weather.			
Criteria	**Evaluation**	**Cost**	**Benefit**
Social	This action does not unfairly affect any one segment of the population. It is available to all Merrimack residents.	0	2
Technical	This action would help to decrease risk and avoid future loss.	0	2
Administrative (including responsible party)	Merrimack has the capability to implement this action. This action would be the responsibility of Emergency Management. It would be implemented through the Fire and Police Departments using a	-1	2

	combination of TV, social media, emergency alerts, and the school district reverse 911 system.		
Political	There is public support to implement and maintain this action.	0	2
Legal	Merrimack has the legal authority to implement this action.	0	1
Economic (including direct cost)	There are no additional costs associated with this project since it is part of the existing Emergency Management budget.	-1	1
Environmental	This action has the potential to reduce property damage and subsequent environmental impacts.	0	1
Subtotal		**-2**	**11**
Total			**9**
Priority			**4**

Mitigation Action: Elevate new roads and bridges above the base flood elevation and raise existing low-lying bridges and roads.			
Criteria	**Evaluation**	**Cost**	**Benefit**
Social	This action is compatible with present and future community values, including ensuring safe, reliable transportation. This action could be disruptive to residents living near construction. It may also affect property owners if easements are taken.	-1	3
Technical	This action solves the problem of bridge and roadway flooding. Steps are also taken to ensure all bridges upstream are at proper elevation to avoid backups.	0	3
Administrative (including responsible party)	Merrimack has the capability to implement and maintain this action. Evaluations of roadways occur annually to ensure it is accomplished in a timely manner. The DPW is the responsible party.	-3	2
Political	There is public and political support to implement and maintain this action.	0	2
Legal	Merrimack has the legal authority to implement this action and no enabling legislation is needed.	0	0
Economic (including direct cost)	This action is very costly to implement. It does fit into the existing Capital Improvements budget.	-3	3
Environmental	This action is beneficial to the environment by reducing flooding and road washout.	0	3
Subtotal		**-7**	**16**
Total			**9**
Priority			**4**

Mitigation Action: Enforce the International Building Code (IBC) and International Residential Code (IRC) to protect buildings and infrastructure from the impacts of earthquakes, hurricanes, winter storms, and tornados.			
Criteria	**Evaluation**	**Cost**	**Benefit**
Social	There are no social impacts associated with this action.	-1	2

	Enforcement would apply evenly across all applicable buildings, including new construction, major renovations, and changes of use.		
Technical	This action is effective at avoiding and reducing future losses and it mitigates the impacts of these hazards.	0	3
Administrative (including responsible party)	Merrimack has the capability to implement this action. Responsibility would fall under the Building Department.	-1	2
Political	There is public and political support to implement and maintain this action.	0	1
Legal	Merrimack has adopted these codes and has the legal authority to enforce them.	0	0
Economic (including direct cost)	This action falls under the existing Building Dept. budget and does not impose additional costs to the Town. It could have a positive economic impact by reducing the number of emergency response calls.	0	1
Environmental	This action has the potential to reduce property damage and subsequent environmental impacts.	0	1
Subtotal		**-2**	**10**
Total			**8**
Priority			**5**

Mitigation Action: Protect critical emergency management facilities and equipment from lightning damage. Install and maintain surge protection and battery backup on critical electronic equipment.			
Criteria	**Evaluation**	**Cost**	**Benefit**
Social	This action will not unfairly affect any segment of the population, disrupt established neighborhoods, or adversely affect cultural resources.	0	3
Technical	This action is effective in avoiding or reducing future losses. It will not create more problems than it solves. It solves the problem rather than only a symptom. It will reduce the losses incurred from a shutdown of critical facilities due to lightning damage.	0	3
Administrative (including responsible party)	Merrimack has the capacity to implement this action. Each department would be responsible for purchasing and installing their own equipment. It can be accomplished in a timely manner.	-1	1
Political	There is public support to implement and maintain this action. The Town Council is also willing to support it.	0	1
Legal	Merrimack has the authority to implement this action. All applicable local and state laws will be followed.	0	0
Economic (including direct cost)	The costs of installing lightning protection devices would be borne by each department under their existing budget. The cost of taking this action is significantly less than the potential costs of damage to critical electronics and facilities.	-2	3
Environmental	This action will not impact the environment.	0	0
Subtotal		**-3**	**11**

Total		**8**
Priority		**5**

Mitigation Action: Require water conservation by enforcing the year round even/odd water ordinance, which limits the days outside watering is allowed based on street address and date.			
Criteria	**Evaluation**	**Cost**	**Benefit**
Social	This action does not unfairly affect any one segment of the population because it is applied evenly to all residents and businesses. It is compatible with present and future community values.	0	0
Technical	The effectiveness of this action depends on the ability of the Town to enforce it. If followed, it would help to reduce the impacts of drought.	0	3
Administrative (including responsible party)	Merrimack has the capability to implement this action. Merrimack Village District is the responsible party.	0	3
Political	The Town Council supports this action. There is general public support for this action, although some residents are unsatisfied with it.	-1	2
Legal	There are no legal issues associated with this action.	0	0
Economic (including direct cost)	Implementation of this action falls under the Merrimack Village District budget. It can be costly to enforce.	-1	0
Environmental	This action has a positive impact on the environment by promoting water conservation.	0	2
Subtotal		**-2**	**10**
Total			**8**
Priority			**5**

Mitigation Action: Implement culvert and bridge capacity improvements at hazard prone locations identified in DPW Plan and Fluvial Erosion Study			
Criteria	**Evaluation**	**Cost**	**Benefit**
Social	There are no social issues associated with this action. It would not unfairly affect any one segment of the population.	0	0
Technical	This action would help to reduce and avoid future losses from flooding.	0	3
Administrative (including responsible party)	The DPW would be responsible for implementing this action. It is part of the Town's regular maintenance program as well as its MS4 permit requirements. There are additional costs associated with reporting.	-1	0
Political	There is public and political support for this action.	0	1
Legal	Merrimack has the authority to implement this action. It also has legal requirements to implement this action under its MS4 permit.	0	0
Economic (including direct cost)	This action is costly to implement. It falls under the existing Public Works budget and additional grant funding is sought	-2	3

	where available. However, it also has long term economic benefits to the community by reducing flooding.		
Environmental	This action has positive environmental benefits and is consistent with community environmental goals.	0	3
Subtotal		**-3**	**10**
Total			**7**
Priority			**6**

Mitigation Action: Protect vulnerable populations from the impacts of extreme temperatures and severe winter storms by establishing heating and cooling centers at designated facilities and providing transportation to and from these centers.			
Criteria	**Evaluation**	**Cost**	**Benefit**
Social	This action primarily benefits Merrimack's most vulnerable residents. It is compatible with present and future community values.	0	3
Technical	This action does not solve the problem of extreme temperatures but it does solve the symptom of exposure.	0	2
Administrative (including responsible party)	Emergency Management/Fire Dept. are responsible for organizing heating and cooling centers. A bus company would be hired to provide mass transportation if needed. The Police Dept. would provide transportation in smaller events.	-2	3
Political	There is public support to implement and maintain this action.	0	3
Legal	Merrimack has the legal authority to implement this action.	0	0
Economic (including direct cost)	If this action could be costly if it was utilized outside of a federally declared disaster. Costs include food, staffing, and transportation.	-2	0
Environmental	There are no environmental impacts associated with this action.	0	0
Subtotal		**-4**	**11**
Total			**7**
Priority			**6**

Mitigation Action: Incorporate flood mitigation into local planning. Revise/adopt subdivision regulations and erosion control regulations to improve floodplain management in Merrimack.			
Criteria	**Evaluation**	**Cost**	**Benefit**
Social	This action would impact property owners subject to the revised subdivision and erosion control regulations. It would have a positive social impact on the community by reducing flooding.	-1	1
Technical	This action helps solve the problem of flood related damage. It is effective in reducing future losses.	0	2
Administrative (including responsible party)	Merrimack has the capability to implement this action. Revisions to regulations require a town vote and public hearing. Community Development is the responsible party for this action.	0	0
Political	There is public support to implement and maintain this action and the Town Council is willing to support it.	0	0
Legal	Merrimack has the legal authority to implement this action.	0	0

Economic (including direct cost)	There are no additional costs to the Town to implement this action because it falls under the existing Community Development budget. There are potential economic costs associated with limiting where development can go.	-1	2
Environmental	This action has positive environmental impacts by encouraging erosion control and reduced floodplain development. It is consistent with community environmental goals.	0	3
Subtotal		**-2**	**8**
Total		**6**	
Priority		**7**	

Mitigation Action: Establish mutual aid agreements with neighboring communities to address administering the NFIP following a major storm event. Form partnerships between local, state, and regional entities to expand resources and improve coordination to support floodplain management.			
Criteria	**Evaluation**	**Cost**	**Benefit**
Social	There are no social impacts related to this action. It will not unfairly affect any segment of the population or disrupt established neighborhoods. It is compatible with present and future community values of working cooperatively with neighboring municipalities.	0	0
Technical	This action may reduce future losses by allowing Merrimack to provide flood aid more quickly. It also helps the Town to know what resources are available for use in an emergency.	0	2
Administrative (including responsible party)	Merrimack has the capability to implement this action and it can be accomplished in a timely manner. Police, Fire, and Public Works departments are each responsible for establishing their own agreements.	-1	3
Political	There is public support to implement and maintain this action and the Town Council is willing to support it.	0	1
Legal	Merrimack has the legal authority to implement this action. No enabling legislation is necessary.	0	0
Economic (including direct cost)	The cost of mutual aid calls would be covered by FEMA if the Town was responding to a declared disaster. This action could add costs for non-declared events (ex. overtime to cover Merrimack needs while its staff is elsewhere).	-1	1
Environmental	This action has no negative environmental impacts. It could positively benefit the environment by improving floodplain management.	0	0
Subtotal		**-2**	**7**
Total		**5**	
Priority		**8**	

Mitigation Action: Remove fuel from urban/wild land interface.			
Criteria	**Evaluation**	**Cost**	**Benefit**
Social	The social impact of this action is unclear because there are differing	-1	1

	opinions on the best way to reduce the risk of wildfire. Also, some people choose to live in wooded areas and accept the risk that wildfire poses to their property.		
Technical	This action would help to avoid or reduce future losses. It has the potential to solve the underlying problem of wildfire by removing the fuel source. It will not create additional problems or cause secondary impacts.	0	3
Administrative	This action imposes an added burden on the Fire Dept.	-2	1
Political	The political impact of this action is unclear for the same reasons noted under social impacts.	-1	1
Legal	There are no legal issues associated with this action.	0	0
Economic	The benefits of fire suppression and reducing property damage could exceed the cost of implementing this action.	-1	2
Environmental	The environmental benefits of preventing a wildfire exceed the environmental impacts associated with this action. Sound logging practices can also help with wildfire prevention.	-1	2
Subtotal		**-6**	**10**
Total			**4**
Priority			**9**

Mitigation Action: Work with FEMA to voluntarily remove structures from flood-prone areas to minimize future flood losses.			
Criteria	**Evaluation**	**Cost**	**Benefit**
Social	This action impacts people with structures in the floodplain. It does not unfairly affect any one segment of the population because participation is voluntary.	0	1
Technical	This action would avoid future losses due to flooding.	0	3
Administrative (including responsible party)	Merrimack does have the capability to implement this action. The Merrimack Finance Dept. would be responsible for this action in cooperation with FEMA.	-1	0
Political	It is unclear whether there is public and political support for this action.	-1	1
Legal	There are no legal issues associated with this action. FEMA is responsible for purchasing the properties. Merrimack simply facilitates the process.	0	0
Economic (including direct cost)	FEMA covers the administrative costs associated with this action. Merrimack would see a loss of tax revenue from the property, however, emergency response costs would also decrease.	-2	1
Environmental	This action would reduce property damage and subsequent environmental impacts. It may also create additional open space in Town, depending on how the parcel was reused.	0	1
Subtotal		**-4**	**7**
Total			**3**

Priority		**10**

Mitigation Action: Prepare, distribute, or make available NFIP, insurance, and building codes explanatory pamphlets.			
Criteria	**Evaluation**	**Cost**	**Benefit**
Social	This action will not unfairly affect any segment of the population, disrupt established neighborhoods, or adversely affect cultural resources.	0	0
Technical	This action would help to avoid or reduce future losses. It has more potential to solve symptoms related to flooding than the underlying problem itself. It will not create additional problems or cause secondary impacts.	0	1
Administrative (including responsible party)	Merrimack has the capability to implement this action. The Administration Department would be the responsible party to implement this action. It can be accomplished in a timely manner.	0	0
Political	There is public support to implement and maintain this action. The Town Council is also willing to support it.	0	0
Legal	Merrimack has the legal authority to implement the action.	0	0
Economic (including direct cost)	This action is consistent with normal Building Department operations and does not impose additional economic costs. It would take roughly 4 hours of staff time per year to implement. The Building Dept. already has materials, however, there would be additional costs associated with making updates.	-1	1
Environmental	This action has the potential to reduce property damage and subsequent environmental impacts only if the recommendations in the literature are implemented.	0	0
Subtotal		**-1**	**2**
Total		**1**	
Priority		**11**	

Section 4.4 ~ Implementing and Administering Mitigation Actions

The Town of Merrimack has integrated its 2010 Hazard Mitigation Plan into a variety of other planning mechanisms, including the Merrimack Emergency Response Plan, Evacuation Plan for the Mastricola and High School Campus, and DPW Plan for Bridge and Culvert Repairs.

In addition, the Town of Merrimack has incorporated and will continue to integrate requirements of the Merrimack Hazard Mitigation Plan Update 2015 into other planning mechanisms. For example, hazard assessments from the Merrimack Hazard Mitigation Plan Update 2015 will be integrated into the Emergency Response Plan.

Updates to Merrimack's Capital Improvement Plan will include any applicable mitigation projects identified in the Hazard Mitigation Plan, such as drainage improvements. The next update to the Town's Master Plan will also incorporate elements of the Hazard Mitigation Plan where applicable.

The Merrimack Hazard Mitigation Team will be responsible for helping Town boards and departments to integrate the Hazard Mitigation Plan into their own planning mechanisms. The Hazard Mitigation Team developed Table 12, which is an action plan that outlines who is responsible for implementing the prioritized mitigation actions, how they will be funded, and when they will be completed.

Table 12—Implementation and Administration

Mitigation Action and Priority Level	Responsible Party	Cost & Funding	Timeframe
1. Implement structural inspections of roofs and deploy trained maintenance personnel for roof snow-removal operations at critical facilities.	Merrimack Fire Department	Cost = $2,500 per building Funding Source: Building and Grounds Maintenance budget for each department	Anticipated start by December 2016. This action will be completed on an ongoing basis throughout the life of the plan.
2. Map and assess vulnerability to erosion. Conduct stream assessments and prepare fluvial erosion hazard zone maps.	NH Department of Environmental Services	Cost = $0 Funding Source: FEMA Pre-Disaster Mitigation Grant	Anticipated start by September 2014. Anticipated completion by September 2015.
3. Protect power lines by working with utility companies to harden electrical infrastructure, including trimming trees near power lines. Consider the costs and benefits of requiring that overhead power lines be buried in all new developments.	Merrimack Highway Department and Merrimack Community Development Department	Cost = $1,200 per large tree removal; $5,000 for preliminary cost benefit review of power line burial Funding Source: Highway Department Tree Service budget; 2013-2014 Budget, Planning/Zoning Administrator Wages line item	Anticipated start by December 2017. This action will be completed on an ongoing basis throughout the life of the plan.
4. Conduct outreach and education programs to increase awareness of earthquakes, extreme temperatures (including carbon monoxide risks), hurricanes, wildfire, severe thunderstorms,	Merrimack Fire and Police Departments	Cost = percentage of $38,275 Funding Source: Fire Dept. Education and Training budget	Anticipated start by April 2015. This action will be completed on an ongoing basis throughout the life of the plan.

Mitigation Action and Priority Level	Responsible Party	Cost & Funding	Timeframe
and severe winter weather.			
5. Elevate new roads and bridges above the base flood elevation and raise existing low-lying bridges and roads.	Merrimack Department of Public Works	Cost = $30,000 design; $170,000 construction Funding Source: Capital Reserve Fund	Anticipated start by January 2016. Anticipated completion by June 2018.
6. Enforce the International Building Code (IBC) and International Residential Code (IRC) to protect buildings and infrastructure from the impacts of earthquakes, hurricanes, winter storms, and tornados.	Merrimack Building Department	Cost = percentage of $57,712 Funding Source: Building Inspector budget	Anticipated start by August 2015. This action will be completed on an ongoing basis throughout the life of the plan.
7. Protect critical emergency management facilities and equipment from lightning damage. Install and maintain surge protection and battery backup on critical electronic equipment.	Each Department	Cost = $200 per department Funding Source: Maintenance—Office Equipment budget for each department	Anticipated start by May 2015. Anticipated completion by May 2016.
8. Require water conservation by enforcing the year round even/odd water ordinance, which limits the days outside watering is allowed based on street address and date.	Merrimack Village District	Cost = $4,400 Advertising & Public Information; $500 Public Education Funding Source: Merrimack Village District	Anticipated start by June 2015. This action will be completed on an ongoing basis throughout the life of the plan.
9. Implement culvert and bridge capacity improvements at hazard prone locations identified in DPW Plan and Fluvial Erosion Study	Merrimack Department of Public Works	Cost = $5,000-$105,000 per culvert; $800,000 per bridge Funding Source: Merrimack CIP	Anticipated start by March 2018. This action will be completed on an ongoing basis throughout the life of the plan.
10. Protect vulnerable populations from the impacts of extreme temperatures and severe winter storms by	Merrimack Fire Department	Cost = percentage of $165,079 Funding Source: Welfare budget	Anticipated start by December 2016. This action will be completed on an

Mitigation Action and Priority Level	Responsible Party	Cost & Funding	Timeframe
establishing heating and cooling centers at designated facilities and providing transportation to and from these centers.			ongoing basis throughout the life of the plan.
11. Incorporate flood mitigation into local planning. Revise/adopt subdivision regulations and erosion control regulations to improve floodplain management in Merrimack.	Merrimack Community Development Department	Cost = percentage of $66,604 Funding Source: 2013-2014 Budget, Planning/Zoning Administrator Wages line item	Anticipated start by January 2017. Anticipated completion by March 2018.
12. Establish mutual aid agreements with neighboring communities to address administering the NFIP following a major storm event. Form partnerships between local, state, and regional entities to expand resources and improve coordination to support floodplain management.	Merrimack Fire, Police, Department of Public Works	Cost = percentage of $9,380 Funding Source: Fire Department Emergency Management budget	Anticipated start by March 2016. Anticipated completion by March 2017.
13. Remove fuel from urban/wild land interface.	Merrimack Fire Department	Cost = $5,000-$50,000 depending on scope and location Funding Source: Fire Department budget	Anticipated start by May 2016. This action will be completed on an ongoing basis throughout the life of the plan.
14. Work with FEMA to voluntarily remove structures from flood-prone areas to minimize future flood losses.	FEMA in cooperation with Merrimack Finance Department	Cost = $0 Funding Source: FEMA	Anticipated start by April 2016. This action will be completed on an ongoing basis throughout the life of the plan.
15. Prepare, distribute, or make available NFIP, insurance, and building codes explanatory pamphlets.	Building Department	Cost = $200 Funding Source: Code Enforcement Clerical Wages	Anticipated start by June 2015. This action will be completed on an ongoing basis

Mitigation Action and Priority Level	Responsible Party	Cost & Funding	Timeframe
			throughout the life of the plan.

CHAPTER 5. PLAN ADOPTION

Section 5.1 ~ Formal Adoption by Governing Body

Section 5.2 ~ FEMA Approval Letter

CERTIFICATE OF ADOPTION

Town of Merrimack, NH TOWN COUNCIL

A RESOLUTION ADOPTING THE TOWN OF Merrimack, NH HAZARD MITIGATION PLAN UPDATE 2015

WHEREAS, the Town of Merrimack has historically experienced damage from natural hazards and it continues to be vulnerable to the effects of earthquake, extreme temperatures, flooding, fluvial erosion, hurricane/tropical storm, severe thunderstorm, severe winter weather, tornado, and wildfire, resulting in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the City/Town of MERRIMACK NH, has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan Update 2015 under the requirements of 44 CFR 201.6; and

WHEREAS, public and committee meetings were held between _____ and _____ regarding the development and review of the Hazard Mitigation Plan Update **2015;** and

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedure for the Town of Merrimack and

WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the Town of Merrimack, with the effect of protecting people and property from loss associated with those hazards; and

WHEREAS, adoption of this Plan will make the Town of Merrimack eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by the Town Council:

1. The Plan is hereby adopted as an official plan of the Town of Merrimack
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Town Council by Merrimack Hazard Mitigation Team

Adopted this day, the _____ of _____, 2015.

_____

Nancy Harrington, Chairman, Merrimack Town Council

IN WITNESS WHEREOF, the undersigned has affixed his/her signature and the corporate seal of the Town of Merrimack, the _____ of _____, 2015.

_____

Witness